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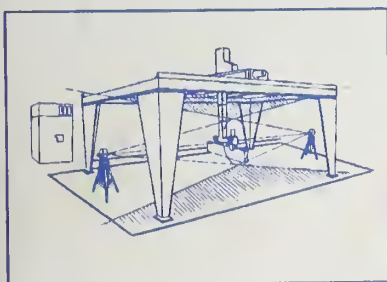
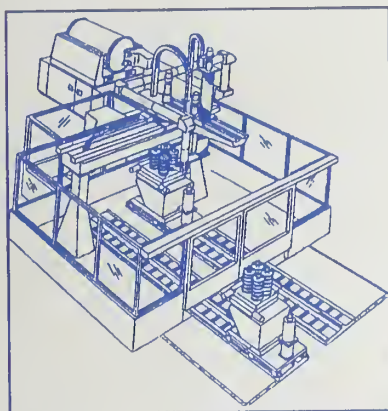
# Current Industrial Reports

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## Manufacturing Technology: Prevalence and Plans for Use 1993



U.S. Department of Commerce  
Economics and Statistics Administration  
BUREAU OF THE CENSUS

## Acknowledgments

The 1993 Survey of Manufacturing Technology: Prevalence and Plans for Use, was a complex project that relied on the talents and efforts of many people. Although the participation of all these individuals was crucial to the success of the project, a number deserve special acknowledgment.

Primary direction of the program was provided by **Thomas L. Mesenbourg**, Acting Associate Director for Economic Programs. This report was prepared in the Manufacturing and Construction Division under the general direction of **John P. Govoni**, Acting Chief. **David W. Cartwright**, Assistant Chief for Manufacturing Census and Related Programs, was responsible for the overall management of this project. **Judy Dodds**, Chief, Food, Textiles, and Apparel Branch; **Donna McCutcheon**, Chief, Publication Coordination Branch; **Stacy Cole**, Chief, Research and Methodology Staff; and **Deborah Tasky**, Chief, Electronic and Information Systems Staff, guided the planning and implementation of this project.

Program responsibility, data processing and analysis, and standard error analysis were shared by the following individuals who participated in the project: **Robert McGrath**, **Thomas Melaney**, **Terry Pennington**, and **Stephen Pope**. Individuals who contributed to the preparation of this report are **Edward Bates**, **Deborah Dillon**, **Alicia Green**, **Mike Haas**, **Richard Hanks**, **Leo Hool**, **Stephen Joseph**, **Nathaniel Shelton**, **Nancy VanDerveer**, **Mary Walter**, and **Kim Yarbrough**.

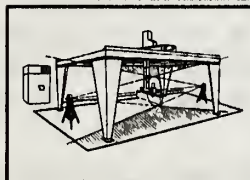
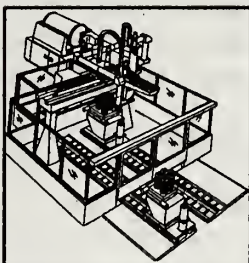
**Lillie M. Skinner** coordinated the various phases of the publication process assisted by **Kelly Taylor** and **Enid Winters**.

The staff of Administrative and Publications Services Division, **Walter C. Odom**, Chief, provided publication planning, design, composition, editorial review, and printing planning and procurement. **Nena Flynn** coordinated and edited the publication. **David Coontz** provided design and graphics services.

This report is the product of a joint effort between the Bureau of the Census and U.S. Army Material Command with the purpose of providing informative statistics on the use of advanced technologies throughout the country's manufacturing environment.

# Current Industrial Reports

## Manufacturing Technology: Prevalence and Plans for Use 1993



Issued November 1994



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**SUGGESTED CITATION**

U. S. Bureau of the Census, Manufacturing Technology: Prevalence and Plans for Use 1993, SMT (93)-3, U. S. Government Printing Office, Washington, DC 1994.

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# Manufacturing Technology: Prevalence and Plans for Use 1993

## INTRODUCTION

In a continuing effort to address and provide detailed information on technology advancement and use, the Bureau of the Census has authored a third report on technology use throughout the United States. The report is entitled "*Manufacturing Technology: Prevalence and Plans for Use*" (SMT/93-3), for 1993. The survey discussed in this report is a direct followup to the original SMT which was published in 1989. Its objective is to again measure the current and planned use of advanced technologies within the country's manufacturing sector and to observe differences that might have occurred during the 5-year span from 1988 to 1993. The Survey of Manufacturing Technology (SMT) for 1993 has expanded the list of questions used in the 1988 edition to fourteen questions. The questions request information on exports, research and development, formal training programs, employment practices, and foreign ownership.

The Bureau of the Census understands the need for accurate and useful data on technology use. It was realized in the early 1980's that information on technology use was in great demand and short supply. Presently, during the early years of a new decade and a new administration the need for advanced technology knowledge is more important than ever. The private business community, as well as the Federal, State, and local governments, require detailed information on technology use to make important corporate and administrative decisions. Therefore, based on the enthusiastic response received on the 1988 edition and with additional financial support from the United States Department of the Army, this survey was developed.

## SCOPE OF THE SURVEY

The SMT is a sample survey of 8,336 establishments with 20 or more employees, selected to represent a total universe of 42,991 manufacturing establishments classified in Standard Industrial Classification (SIC) Major Groups 34 through 38. These major groups accounted for 43 percent of all employees and value added as reported in the 1987 Census of Manufactures.

SIC Major Group	Description
34	Fabricated Metal Products
35	Industrial Machinery and Equipment
36	Electronic and Other Electric Equipment
37	Transportation Equipment
38	Instruments and Related Products

The SMT questionnaire was designed to obtain reliable measures of prevalence for 17 advanced technologies. These methods used to obtain these measures are as follows: time frames in which the manufacturing establishments started to use or planned to use the specific technology, significant reasons for using the technology, those with no plans to use the technology, and specific information on plant characteristics using time frames for when they started using or plan to use, significant reasons for using, and no plans to use, and specific information on plant characteristics. The 17 technologies were chosen from the following general areas:

- Design and engineering
- Fabrication/ machining and assembly
- Automated material handling
- Automated sensor-based inspection and/or testing
- Communication and control

For a complete description of the advanced technologies covered by this questionnaire, see appendix B, Report Form.

## SUMMARY OF FINDINGS

**General Use of Advanced Technology.** In 1993, most manufacturing plants classified in SIC Major Groups 34 through 38 used at least one of the 17 advanced technologies included on the survey in their production operations. In the survey, it was found that 75 percent of the plants use at least one technology, with 29.1 percent reporting that they use five or more of the technologies. This was an



increase over the 1988 figures of 68.4 percent using at least one and 23.1 percent using more than five. Larger plants tend to adopt all of the technologies in this survey more rapidly than smaller plants. Of those establishments with 500 or more employees, 90.6 percent and 80.2 percent reported the use of at least one and at least five technologies, respectively, compared with 69.1 and 18.3 percent, respectively, for establishments with less than 100 employees. However, establishments with less than 100 employees showed a significant increase in technologies used, over the 1988 data. In 1993, an additional 38.6 percent reported using at least one technology and an additional 13.5 percent reported using five or more technologies. During the 5-year span, those establishments with 100 to 499 employees showed the most significant increase in using two or more technologies, from 72.1 percent to 82.5 percent, and also showed an increase in using five or more technologies (37.4 percent to 50.3 percent).

While a very limited amount of time has been spent trying to draw conclusions from the data, the following aspects of the establishment characteristics were found to be interesting.

- Advanced technology use tended to be greatest when a plant performed both fabrication/machining and assembly at the same location. When compared with 1988, the 1993 data showed a steady increase in the use of one or more technologies in all the manufacturing processes.
- For 1993, narrow differences separated the different SIC major groups, with the exception of Major Group 34, "Fabricated Metal Products," where advanced technology use was consistently less than the other major groups.
- The age of the plant and use of advanced technologies showed little direct relationship.
- Of those establishments who exported 20 to 49 percent of their total shipments, 93.5 percent use at least one or more advanced technologies.
- Those establishments who do their own research and development used more advanced technologies than those who have no research and development program.
- Foreign ownership seemed to be a factor in advanced technology usage. The use of advanced technologies was generally at least 10 percent higher among those establishments whose ownership was 10 percent or more foreign.

**Prevalence of Individual Advanced Technologies.** Prevalence of the 17 advanced technologies in this report varied widely. Marked differences occurred when establishments were grouped by different characteristics. The establishment characteristics used to group plants in this report included the number of employees at the plant, the plant's

age, the type of processing employed at the plant, the market for most products of the plant, the market price for most products of the plant, whether or not any of the products of the plant are made to military specifications, whether the plant is a contractor to the U.S. military, and which Federal Defense Agency directly purchases a plant's products.

Establishments were not asked to provide the extent of use of a technology in their operations. For example, regardless of whether an establishment had one pick and place robot or 100 pick and place robots in place, each establishment was counted equally as using pick and place robots in their operations. Therefore, interpretations as to the extent of use and penetration for a technology should be made cautiously. In addition, all references to plans to use a given technology are for those establishments that do not currently use the technology in their operations. While it is realized that establishments currently using a given technology may have plans to acquire more of that technology in the future, this information was not collected in the survey.

What follows are brief highlights of the survey findings for each of the 17 technologies covered by the survey.

**Computer-Aided Design (CAD) and/or Computer-Aided Engineering (CAE).** In 1993 CAD/CAE systems were the most prevalent of the 17 advanced technologies on this survey. A total of 58.8 percent of the establishments reported that they currently use CAD or CAE systems. In addition, these technologies had the lowest number of establishments reporting that they had no plans to use them.

As with many of the technologies, large establishments were more likely to have adopted CAD or CAE systems. Of those establishments with more than 500 employees, 87.2 percent used CAD/CAE systems in their operations, compared with only 49.5 percent for those plants with less than 100 employees. Establishments producing products with a higher market value were more likely to have adopted CAD/CAE. Those plants manufacturing products with a market price of over \$10,000 used CAD/CAE systems at a 83.4 percent rate versus 46.3 percent of those establishments whose products had a market price of less than \$5.

When establishments were asked to give the single most significant reason for adopting CAD/CAE systems, they reported a virtual tie between two reasons. The two reported were improved quality and increased output.

**Computer-Aided Design (CAD)/Computer-Aided Manufacturing (CAM).** A substantially smaller number of establishments reported that they used CAD output to control machines used for manufacturing. Less than one-half of the number of establishments who reported that they used CAD/CAE systems reported that they used CAD/CAM. Also, a large portion of the sample, 49.5 percent, responded that they have no plans to use CAD/CAM in the future. However, the use of CAD/CAM technology did almost



double during the 5-year span between 1988 and 1993. The prevalence in Major Group 35, "Industrial Machinery and Equipment," increased significantly, along with increases in the other major groups.

The use of CAD/CAM systems was more common in those establishments that were defense contractors. It ranked fifth in "used in operations" of all technologies, for establishments that shipped products directly to Federal Defense Agencies.

**Digital Data Representation.** The use of digital representation of CAD output for controlling machines used in procurement activities was another technique covered in this survey. It is one of the technologies that, when compared with the 1988 survey results, did not become as prevalent as expected. Still, significant increases in "used in operations" did occur. Again, establishments with 500 or more employees used it at more than twice the rate as others. The most significant reason reported for using the technology was improved quality.

**Flexible Manufacturing Cells or Systems (FMC or FMS).** Overall, 67.5 percent of establishments had no plans to use this technology in the near future. This figure ranked seventh among all 17 of the technologies covered by our survey. The establishments responded that improved quality (12.2 percent) and increased output (13.7 percent) were their primary reasons for using this technology. Of the establishments reporting that they used FMC for systems, 20.7 percent indicated that the transportation industry was the primary market for their products.

**Numerically Controlled or Computer Numerically Controlled Machines (NC/CNC).** Of the technologies surveyed, NC/CNC was the second most commonly used (46.9 percent). Establishments classified in Major Group 35, "Industrial Machinery and Equipment," reported the highest prevalence of this advanced technology (61.8 percent).

**Materials Working Lasers.** Materials working lasers technology was the fourth least-used of the 17 technologies surveyed (5.0 percent). It is another technology that is being adopted more slowly than expected from the 1988 survey. Still the number of establishments that reported that they used it in their operations grew over 20 percent from 1988 to 1993.

**Pick and Place Robots.** Unlike most of the technologies covered by this survey, pick and place robots were more likely to be found at older plants than at new ones. Use of this technology was most common in Major Group 36, "Electronic and Other Electric Equipment." Of the technologies covered by this survey, this one had fewer respondents with any plans to acquire it in the next 5 years.

**Other Robots.** A large percentage (82.3 percent) of establishments reported that they had no plans to use this technology in the next 5 years. It ranked third of all the technologies for no plans to use.

**Automatic Storage and Retrieval Systems (AS/RS).** Only 2.6 percent of the respondents reported that they were using AS/RS. Just 4.5 percent of the establishments planned to use it within the next 5 years, and 83.1 percent of the establishments reporting had no plans to use it at all. This technology was one of the few whose prevalence actually fell from 1988 to 1993.

**Automatic Guided Vehicle Systems (AGVS).** The AGVS was by far the least used technology, as indicated by the respondents to this survey. Just 1.1 percent of all establishments reported that they used AGVS in their operations. In addition, 86.9 percent of the firms responded that they had no plans to use it, and only 2.1 percent responded that they plan to use it within the next 5 years. The 1988 data suggested a slow adoption rate for AGVS over the next 5 years; however, the 1993 SMT shows an actual decline in the number of establishments that reported using AGVS in their operations.

**Automated Sensor-Based Inspection or Testing.** The survey separated this technology into two categories: (1) used on incoming or in-process materials and (2) used on final product. The prevalence of both of these technologies remained essentially unchanged between the 1988 and 1993 surveys. There was a slight difference in the industries that had most often adopted the technology. Automated sensor-based inspection or testing on incoming or in-process materials was more prevalent in Major Group 37, "Transportation Equipment;" however, use on the final product was more common in Major Group 36, "Electronic and Other Electrical Equipment."

**Local Area Networks for Technical Data (LAN-T).** The responses to the 1988 survey indicated that prevalence of LAN-T in manufacturing establishments would nearly double in 5 years. While the results of the 1993 survey showed that many of the plans to acquire this technology were not realized, there was still a large increase in the prevalence. As with the 1988 survey, establishments in Major Group 38, "Instruments and Related Products," were the most common users of this technology (40.7 percent).

**Local Area Networks for Factory Use (LAN-F).** In the 1993 survey, 22.1 percent of the respondents reported that they used LAN-F in their manufacturing operations. This is several percentage points higher than the 1988 survey of 16.2 percent.

**Intercompany Computer Networks Linking Plants to Subcontractors, Suppliers, and/or Customers.** The 1993 use of this technology (17.9 percent) did not meet the 1993 expectations of 35.1 percent reported in the 1988 survey. There was, however, a significant increase in the prevalence of the technology. In addition, a substantial percentage of our respondents reported that their establishment planned to acquire the technology in the next 5 years.

**Programmable Controllers.** The number of establishments that reported in the 1993 survey that they were using programmable controllers was 30.4 percent. This technology ranked third among all technologies surveyed (behind CAD systems and NC/CNC machines). Its prevalence was spread equally throughout the SIC major groups surveyed.

**Computers Used for Control on the Factory Floor.** This technology was one that had fairly broad use among both large- and medium-sized establishments. Of the establishments that reported they used this technology, 62.8 percent had over 500 employees, and 41.8 percent had 100 to 499 employees. The age of the plant and type of manufacturing process did not vary significantly among the establishments using this technology.



Table 1. PERCENTAGE OF ESTABLISHMENTS USING AND PLANNING TO USE TECHNOLOGIES, BY CHARACTERISTIC OF THE ESTABLISHMENT

Establishment characteristic	Year	Number of establishments <sup>1</sup> (a)	Minimum number of technologies used (Percent of establishments)							Planning to acquire at least 1 additional technology within 5 years						
			0 (b)	1 (c)	2 (d)	3 (e)	4 (f)	5 (g)	Not specified <sup>2</sup>	Percent of column:						
										A	B	C	D	E	F	G
All establishments . . . . .	1993	42,991	17.9	75.0	62.2	51.1	39.0	29.1	7.0	52.3	31.3	46.3	51.2	60.4	70.0	71.4
	1988	39,556	23.7	68.4	54.1	41.6	31.7	23.1	7.9	59.7	42.0	72.7	78.1	78.7	79.4	80.0
Major Group:																
34, Fabricated Metal Products . . . . .	1993	13,190	25.1	67.1	52.2	42.6	32.0	22.3	7.8	48.3	30.8	43.0	46.3	57.4	75.8	73.1
	1988	12,746	32.6	58.6	44.1	32.2	24.1	17.0	8.8	54.6	39.7	71.0	75.9	79.3	79.1	82.1
35, Industrial Machinery and Equipment . . . . .	1993	14,231	12.5	81.5	69.8	56.7	41.5	30.2	6.1	53.4	29.6	44.5	52.5	57.3	69.4	69.9
	1988	13,176	18.1	75.6	61.1	46.2	33.8	23.1	6.3	62.3	46.5	71.3	72.9	76.0	77.2	77.9
36, Electronic and Other Electric Equipment . . . . .	1993	7,472	13.6	78.8	66.5	55.5	45.4	35.6	7.6	56.0	40.4	52.5	52.9	66.8	63.4	71.0
	1988	7,293	17.1	73.4	59.8	48.2	39.0	30.1	9.5	63.0	41.3	76.2	79.8	81.1	81.6	83.2
37, Transportation Equipment . . . . .	1993	4,110	24.3	68.7	55.6	47.6	39.1	33.2	7.0	51.4	27.6	46.5	58.4	67.8	68.4	72.7
	1988	3,425	28.2	62.7	49.3	41.5	34.4	28.7	9.2	57.7	36.6	75.6	80.2	82.7	83.5	85.5
38, Instruments and Related Products . . . . .	1993	3,988	15.3	78.0	66.8	55.0	40.7	31.1	6.7	55.0	29.9	54.2	51.1	66.4	67.0	72.2
	1988	2,916	21.3	72.3	58.0	45.8	33.6	25.8	6.4	63.8	50.3	73.5	77.5	78.4	79.7	80.3
Employment size:																
20 to 99 . . . . .	1993	30,502	23.2	69.1	53.4	40.9	27.9	18.3	7.7	47.4	31.1	44.7	50.1	57.6	70.4	69.4
	1988	27,369	30.5	60.9	44.5	30.9	21.3	13.2	8.6	53.7	41.4	67.4	70.5	73.7	73.0	74.2
100 to 499 . . . . .	1993	10,321	5.8	89.3	82.5	73.7	62.3	50.3	5.0	64.6	35.8	56.9	56.3	69.6	69.4	74.5
	1988	9,903	10.1	83.2	72.1	60.3	48.1	37.4	6.7	71.5	46.8	80.3	82.9	83.5	85.0	86.0
500 and over . . . . .	1993	2,168	2.5	90.6	89.1	87.4	84.1	80.2	6.9	61.8	5.5	46.9	44.4	66.7	68.6	69.0
	1988	2,284	1.5	93.7	91.4	89.3	85.1	79.4	4.8	80.3	57.8	84.7	84.8	85.0	85.2	85.1
Age of plant (years):																
Less than 5 . . . . .	1993	4,893	16.1	82.9	65.5	51.4	37.4	23.4	1.0	59.5	41.1	49.2	47.8	70.9	73.9	73.7
	1988	4,731	25.6	74.0	56.4	42.8	31.5	22.4	0.4	66.5	51.3	72.1	76.7	77.1	76.8	78.5
5 to 15 . . . . .	1993	13,722	17.3	81.2	68.2	54.9	41.0	30.9	1.5	58.0	42.4	45.1	52.1	61.7	70.7	71.8
	1988	12,295	24.7	75.2	59.6	45.4	34.7	25.2	0.1	65.5	44.6	72.4	75.4	78.9	80.0	81.7
16 to 30 . . . . .	1993	11,303	15.6	83.4	68.8	57.8	43.2	32.6	1.0	56.3	26.5	51.9	51.4	55.5	66.1	73.1
	1988	10,690	25.7	73.9	58.4	45.8	33.9	24.3	0.4	66.2	42.9	74.6	77.7	80.1	80.3	82.6
Over 30 . . . . .	1993	9,310	18.6	80.3	67.8	57.2	46.9	36.7	1.1	55.6	35.4	40.5	51.7	59.5	70.8	68.4
	1988	8,464	25.2	74.4	60.5	46.7	37.3	28.1	0.4	62.1	36.1	71.3	74.8	77.5	78.8	80.1
Not specified . . . . .	1993	3,763	28.2	4.1	1.9	1.8	1.4	0.5	67.7	1.6	0.6	8.6	71.4	21.4	78.8	63.2
	1988	3,377	7.2	3.0	1.6	0.5	0.1	0.1	89.8	2.3	5.5	63.1	65.8	64.4	100.0	100.0
Manufacturing process:																
Fabrication/machining . . . . .	1993	6,795	19.2	80.3	62.3	49.9	35.1	26.9	0.5	50.7	35.8	42.5	40.7	53.9	57.5	68.4
	1988	6,870	27.0	72.7	55.9	42.1	30.6	18.9	0.3	59.2	36.5	67.9	71.2	74.6	75.5	78.3
Assembly . . . . .	1993	6,388	18.5	79.9	62.9	49.8	38.5	26.9	1.6	55.3	40.2	50.9	50.2	62.0	66.1	66.6
	1988	5,688	26.6	73.0	55.9	41.9	32.3	24.9	0.4	61.2	36.1	70.8	75.1	76.6	76.5	78.5
Both . . . . .	1993	23,393	13.4	85.7	74.1	62.2	48.4	36.6	0.9	62.3	42.9	48.0	55.2	63.0	74.6	73.6
	1988	21,016	21.2	78.6	64.1	50.2	38.7	28.8	0.1	70.4	52.3	75.4	78.0	80.5	81.2	82.5
Neither . . . . .	1993	2,577	39.0	56.3	38.8	29.1	19.8	13.4	4.7	32.5	11.1	39.5	45.4	53.6	64.8	58.3
	1988	2,619	50.2	48.3	32.3	22.8	16.8	13.1	1.5	44.4	27.9	62.9	71.0	74.8	77.7	79.4
Not specified . . . . .	1993	3,838	28.1	5.3	3.4	2.8	1.8	1.1	66.6	2.1	1.0	22.4	52.4	25.6	3.6	73.2
	1988	3,363	7.0	3.0	2.3	1.1	0.7	0.7	90.0	2.5	6.4	69.0	75.8	73.2	89.4	88.9
Market for most products:																
Consumer . . . . .	1993	4,358	26.4	69.6	53.4	45.3	35.8	26.3	3.9	56.9	38.6	51.9	55.6	66.0	75.1	77.6
	1988	4,451	38.2	61.6	47.1	36.9	28.9	21.1	0.2	60.2	39.5	73.4	74.6	76.1	77.1	75.4
Commercial . . . . .	1993	5,791	13.9	85.7	70.8	59.4	44.0	32.3	0.4	60.4	37.8	50.9	57.4	59.8	71.7	72.7
	1988	5,342	23.5	76.4	61.9	48.3	36.2	26.5	0.1	70.6	54.2	75.7	78.0	81.0	82.2	83.0
Industrial . . . . .	1993	18,798	15.7	83.4	69.1	56.5	42.1	30.7	0.9	56.0	34.7	44.3	51.0	58.5	68.2	70.4
	1988	17,881	23.6	78.2	60.1	44.9	32.8	23.1	0.2	65.2	44.7	71.8	75.2	78.3	79.0	81.4
Transportation . . . . .	1993	3,974	13.7	85.5	72.8	60.4	50.1	42.0	0.8	62.8	44.9	46.2	48.3	70.6	70.5	75.9
	1988	3,243	21.7	77.9	65.1	52.9	45.3	35.2	0.4	68.7	39.3	77.3	82.2	83.1	81.8	82.6
Government . . . . .	1993	2,141	9.7	90.1	78.0	64.6	51.8	40.7	0.2	53.6	35.6	45.3	36.5	49.5	63.2	65.2
	1988	2,628	12.8	88.8	71.7	60.9	49.8	38.0	0.6	70.6	43.3	75.0	78.5	79.5	80.3	82.9
Other . . . . .	1993	3,679	23.3	75.1	62.8	49.4	37.7	26.9	1.6	53.7	30.7	43.4	54.2	61.6	75.8	68.8
	1988	2,137	33.4	85.8	48.4	33.3	24.6	18.8	1.1	53.9	34.0	64.9	67.3	71.2	75.0	78.0
Not specified . . . . .	1993	4,252	28.5	11.5	10.4	7.9	5.7	4.2	60.0	8.0	5.4	24.5	43.8	79.3	70.3	55.9
	1988	3,898	11.6	10.4	7.4	5.2	4.1	3.0	78.0	7.0	9.2	56.7	67.1	68.1	68.3	80.2

See footnotes at the end of the table.

Table 1. PERCENTAGE OF ESTABLISHMENTS USING AND PLANNING TO USE TECHNOLOGIES, BY CHARACTERISTIC OF THE ESTABLISHMENT—Continued

Establishment characteristic	Year	Number of establishments <sup>1</sup> (a)	Minimum number of technologies used (Percent of establishments)							Planning to acquire at least 1 additional technology within 5 years						
			0 (b)	1 (c)	2 (d)	3 (e)	4 (f)	5 (g)	Not specified <sup>2</sup>	Percent of column:						
										A	B	C	D	E	F	G
Market price for most products:																
Less than \$5 .....	1993	5,274	22.4	76.1	61.4	51.9	43.7	34.6	1.6	60.9	37.3	53.0	54.1	69.5	80.6	76.7
	1988	5,101	32.1	67.8	52.0	40.4	30.3	22.5	0.1	65.3	39.8	77.5	80.4	82.5	83.5	84.7
\$5 to \$100 .....	1993	10,422	18.8	79.8	65.0	54.3	41.2	31.6	1.4	59.4	37.1	50.8	59.5	56.4	72.2	76.8
	1988	9,209	26.3	73.2	56.7	43.1	34.0	25.0	0.5	64.0	41.2	72.6	76.5	78.8	78.1	83.3
\$101 to \$1,000 .....	1993	8,846	16.2	82.8	69.6	56.1	42.0	29.5	0.9	57.7	36.3	48.5	46.6	66.2	60.6	75.2
	1988	7,843	25.1	74.7	59.7	45.2	33.8	24.1	0.3	64.0	39.0	72.6	75.8	77.9	78.9	79.2
\$1,001 to \$2,000 .....	1993	2,023	20.1	79.2	60.3	48.5	37.1	28.6	0.8	51.9	25.9	48.3	54.0	47.4	69.8	69.7
	1988	2,002	23.2	76.8	60.8	46.9	33.2	24.9	-	63.8	38.7	71.3	73.8	77.6	81.5	85.4
\$2,001 to \$10,000 .....	1993	4,265	14.6	84.5	71.7	56.5	42.3	30.0	1.0	55.2	36.2	40.6	57.0	54.8	71.4	65.1
	1988	4,436	26.0	73.8	60.1	44.4	32.6	23.0	0.2	66.2	48.0	72.8	74.4	79.0	80.5	81.6
Over \$10,000 .....	1993	7,340	9.0	90.5	77.0	63.7	47.5	35.8	0.5	54.9	38.8	38.9	41.2	62.6	73.8	61.2
	1988	6,328	17.9	81.9	66.8	53.3	41.0	30.0	0.2	70.2	59.1	72.7	76.0	78.4	79.7	79.7
Not specified .....	1993	4,821	30.2	15.5	12.9	11.3	8.1	6.1	54.3	10.8	9.7	4.9	54.4	48.4	63.3	67.1
	1988	4,639	13.0	21.3	16.0	13.2	10.9	8.2	65.7	15.3	20.0	59.8	68.9	71.9	71.0	68.2
Products made to military specifications:																
Yes. ....	1993	14,112	10.4	88.9	77.2	65.5	51.3	39.5	0.8	64.1	45.6	46.3	58.6	65.4	72.7	74.1
	1988	14,588	16.2	83.7	69.0	55.0	44.6	33.4	0.1	71.3	50.0	75.5	78.2	80.5	80.2	82.1
No .....	1993	22,214	20.1	78.4	63.7	51.4	38.5	28.0	1.5	53.7	33.1	47.6	47.4	58.2	69.1	69.6
	1988	19,439	31.0	68.6	52.2	38.8	27.6	19.5	0.4	60.7	39.9	70.4	74.6	77.2	78.9	80.0
Don't know .....	1993	2,939	25.1	73.9	55.9	43.1	31.8	23.6	1.0	49.0	34.6	43.5	47.7	50.6	61.3	66.4
	1988	2,141	36.0	63.2	50.0	40.1	28.7	20.4	0.8	59.7	41.7	70.6	69.4	73.1	74.4	78.9
Not specified .....	1993	3,726	28.3	3.3	1.2	1.0	0.4	0.4	68.4	1.4	1.8	7.8	20.0	50.0	-	100.0
	1988	3,388	6.1	4.4	3.3	1.7	1.2	1.0	89.5	3.8	13.0	68.3	82.1	100.0	100.0	100.0
Percent, on an annual basis, of all products manufactured at the plant, that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:																
Yes:																
1 to 25 percent. ....	1993	9,934	9.3	90.1	78.1	68.0	53.5	41.9	0.6	65.8	49.3	56.8	55.4	65.1	73.6	73.5
	1988	10,101	18.7	81.2	66.6	52.4	41.3	30.9	0.1	71.9	50.4	77.0	79.0	80.1	80.1	81.3
26 to 75 percent. ....	1993	2,499	10.5	89.3	82.1	67.9	51.0	38.4	0.2	62.3	42.6	69.1	49.0	47.9	71.1	75.3
	1988	1,012	10.9	88.9	74.9	63.6	51.0	36.9	0.1	75.3	67.7	76.4	77.4	78.9	76.4	80.4
Over 75 percent .....	1993	1,148	13.5	86.2	77.0	61.4	48.3	38.2	0.3	52.4	18.7	35.8	40.2	68.0	59.8	66.3
	1988	683	17.7	80.2	67.4	61.9	52.0	39.6	2.1	65.3	43.3	71.9	75.3	76.6	76.2	78.3
Don't know .....	1993	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
	1988	601	27.5	72.5	59.3	48.6	38.7	28.9	-	63.1	27.7	76.6	77.1	79.8	82.7	85.2
No:																
None. ....	1993	11,808	24.4	73.7	57.1	45.8	34.0	24.2	1.8	49.2	31.9	35.8	48.0	60.8	66.3	67.7
	1988	22,874	29.1	70.6	54.4	40.8	30.1	21.4	0.3	61.3	40.1	70.3	74.3	77.8	79.1	81.0
Don't know .....	1993	13,573	17.7	81.2	66.7	53.3	40.2	29.1	1.1	57.7	37.0	51.0	53.2	58.9	70.8	72.5
	1988	1,028	25.8	73.5	59.8	46.5	36.9	27.0	0.7	69.0	48.7	76.8	80.3	82.1	84.5	85.0
Not specified .....	1993	4,029	26.9	9.0	5.8	4.5	3.5	3.2	64.1	3.2	0.6	13.2	38.0	51.2	63.6	44.2
	1988	3,349	5.5	4.0	3.1	1.6	1.3	1.3	90.4	2.8	12.5	53.4	64.3	70.1	75.4	74.1
Percent of the plant's total value of shipments that are exported for direct sale:																
None .....	1993	13,687	25.9	72.3	55.8	44.6	31.9	21.6	1.7	47.6	29.0	34.4	48.0	56.8	67.3	69.0
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Less than 10 percent. ....	1993	15,360	15.5	83.6	69.6	58.0	45.0	34.4	0.9	60.7	42.2	54.5	52.4	62.2	70.9	72.2
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
10 to 19 percent .....	1993	4,737	9.0	90.4	78.6	66.4	53.5	39.6	0.6	64.3	42.1	61.3	48.8	63.9	71.9	73.5
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
20 to 49 percent .....	1993	3,912	6.0	93.5	85.6	70.5	55.1	44.3	0.5	66.2	53.6	58.6	53.1	65.9	73.3	72.9
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
50 percent or more .....	1993	1,398	8.7	90.2	78.6	64.2	48.6	40.0	1.1	57.5	45.5	45.7	55.2	51.1	67.5	66.4
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Not specified .....	1993	3,897	25.6	8.2	5.6	4.1	2.6	2.4	66.2	4.8	1.9	18.0	89.7	50.0	66.7	69.6
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)

See footnotes at the end of the table.



Table 1. PERCENTAGE OF ESTABLISHMENTS USING AND PLANNING TO USE TECHNOLOGIES, BY CHARACTERISTIC OF THE ESTABLISHMENT—Continued

Establishment characteristic	Year	Number of establishments <sup>1</sup> (a)	Minimum number of technologies used (Percent of establishments)							Planning to acquire at least 1 additional technology within 5 years						
			0 (b)	1 (c)	2 (d)	3 (e)	4 (f)	5 (g)	Not specified <sup>2</sup>	Percent of column:						
										A	B	C	D	E	F	G
Where is most of the research and development work for the plant done:																
Outside the firm . . . . .	1993	1,834	23.0	76.4	58.1	41.8	31.0	24.2	0.6	45.6	37.9	44.9	39.8	41.1	64.5	55.0
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
In the plant. . . . .	1993	25,416	13.0	86.0	73.1	60.0	45.1	33.2	1.0	60.9	44.2	50.0	53.8	62.7	71.9	71.7
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Elsewhere in the firm . . . . .	1993	4,969	10.9	88.4	77.9	68.7	59.7	49.3	0.7	63.0	41.3	51.4	47.0	65.6	62.0	74.0
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
No research and development done . . . . .	1993	7,046	34.2	64.0	45.0	35.6	24.4	16.2	1.7	41.9	22.1	37.2	46.2	52.0	69.0	70.5
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Not specified . . . . .	1993	3,726	27.5	2.8	1.2	1.2	0.8	0.6	69.7	1.6	3.5	6.7	-	26.7	-	70.8
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Where is most of the formal training for the plant conducted:																
In the plant. . . . .	1993	29,449	16.3	82.4	68.4	56.8	43.7	32.8	1.3	57.2	38.7	45.8	49.8	61.0	68.4	71.0
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Elsewhere in the firm . . . . .	1993	1,099	9.9	89.2	79.1	73.5	60.6	51.5	0.9	64.5	60.6	51.4	52.5	71.1	64.0	68.8
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Outside the firm . . . . .	1993	3,506	9.6	90.4	80.2	67.2	53.4	40.5	-	70.0	36.2	55.3	70.7	69.1	81.5	77.9
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
No formal training for staff . . . . .	1993	5,251	28.3	70.8	53.6	38.7	24.7	15.3	1.0	45.3	23.8	45.2	46.1	50.7	71.1	66.1
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Not specified . . . . .	1993	3,686	26.6	3.4	2.0	1.6	1.3	1.2	70.0	2.0	1.2	26.9	43.8	-	100.0	77.8
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Who conducts most of the formal training for the staff:																
Staff from inside the plant . . . . .	1993	26,952	17.5	81.1	66.4	54.3	41.3	30.5	1.4	55.4	38.4	44.5	47.7	60.0	68.3	69.4
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Staff from outside the plant . . . . .	1993	1,637	7.7	92.3	81.7	74.8	63.2	52.7	-	67.5	65.9	55.2	55.4	67.9	51.4	74.9
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Trainers from outside the firm . . . . .	1993	5,287	7.5	92.4	84.9	73.9	60.1	48.0	0.1	73.9	35.3	69.9	74.4	69.7	81.7	79.7
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Not specified . . . . .	1993	9,115	27.1	43.8	33.1	24.1	15.4	9.7	29.1	27.6	15.3	42.0	48.0	51.9	71.5	62.7
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Difficulty in hiring skilled personnel to work with the technologies used in the plant:																
Not difficult. . . . .	1993	13,905	27.6	71.0	55.2	43.8	33.6	24.0	1.4	48.5	29.9	38.8	47.6	57.5	63.3	69.6
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Some problems . . . . .	1993	19,836	11.5	87.9	74.3	61.8	47.7	36.3	0.6	61.6	43.8	52.1	51.8	60.6	74.7	71.6
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Very difficult . . . . .	1993	5,401	9.3	88.7	77.7	65.7	47.5	35.3	2.0	63.2	48.9	49.8	58.2	64.3	67.7	74.3
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Not specified . . . . .	1993	3,849	28.2	4.3	2.7	1.9	1.3	1.3	67.5	2.3	1.5	21.3	45.2	56.0	-	61.2
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:																
Yes. . . . .	1993	3,265	5.5	93.5	84.4	73.2	62.3	49.9	1.0	64.5	35.8	72.5	44.5	74.2	59.8	71.0
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
No . . . . .	1993	34,703	18.6	80.3	65.6	53.5	39.9	29.3	1.2	56.0	35.5	44.9	51.7	60.1	71.0	71.3
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Don't know. . . . .	1993	1,447	11.2	88.8	80.8	68.6	58.5	46.9	-	62.8	37.0	51.7	52.5	46.9	71.6	74.5
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Not specified . . . . .	1993	3,576	25.9	2.0	1.0	1.0	0.4	0.4	72.1	0.4	0.4	-	-	-	-	78.6
	1988	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)

Note: Data may not add to the totals due to the independent rounding of individual figures.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.

Table 2A. NUMBER AND PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, AND IMPLEMENTING SELECTED TECHNOLOGIES

Technology	Year	Used in operations		When technology was first implemented						Not specified <sup>1</sup>		Absolute standard error of "Used in operations" <sup>2</sup>	
				Within the past 2 years		The last 2 to 5 years		More than 5 years ago					
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Design and engineering:													
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	1993	25,139	58.8	5,290	12.4	11,194	26.2	8,284	19.4	371	0.9	1.3	0.7
	1988	15,436	39.0	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	1.4	0.6
CAD output used to control manufacturing machines . . . . .	1993	10,961	25.6	2,520	5.9	4,653	10.9	3,614	8.4	174	0.4	2.5	0.6
	1988	6,680	16.9	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	2.7	0.5
Digital representation of CAD output used in procurement . . . . .	1993	4,850	11.3	1,642	3.8	2,069	4.8	983	2.3	156	0.4	4.0	0.4
	1988	3,924	9.9	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	3.5	0.3
Fabrication/machining and assembly:													
Flexible manufacturing cells or systems .	1993	5,437	12.7	1,651	3.9	1,992	4.7	1,633	3.8	161	0.4	3.3	0.4
	1988	4,217	10.7	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	3.1	0.3
Numerically controlled or computer numerically controlled machines . . . . .	1993	20,078	46.9	1,874	4.4	4,994	11.7	12,679	29.6	531	1.2	1.5	0.7
	1988	16,368	41.4	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	1.4	0.6
Materials working lasers . . . . .	1993	2,120	5.0	641	1.5	538	1.3	846	2.0	94	0.2	5.5	0.3
	1988	1,716	4.3	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	4.9	0.2
Pick and place robots . . . . .	1993	3,679	8.6	824	1.9	1,280	3.0	1,474	3.4	101	0.2	3.3	0.3
	1988	3,057	7.7	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	2.9	0.2
Other robots . . . . .	1993	2,035	4.8	405	0.9	762	1.8	805	1.9	63	0.1	4.1	0.2
	1988	2,246	5.7	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	3.8	0.2
Automated material handling:													
Automatic storage and retrieval systems . . . . .	1993	1,121	2.6	233	0.5	381	0.9	468	1.1	40	0.1	5.6	0.1
	1988	1,252	3.2	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	5.0	0.2
Automatic guided vehicle systems . . . . .	1993	471	1.1	66	0.2	164	0.4	203	0.5	38	0.1	6.6	0.1
	1988	596	1.5	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	6.9	0.1
Automatic sensor-based inspection or testing:													
Performed on incoming or in-process materials . . . . .	1993	4,230	9.9	1,017	2.4	1,495	3.5	1,554	3.6	164	0.4	3.7	0.4
	1988	3,937	10.0	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	3.1	0.3
Performed on final product . . . . .	1993	5,360	12.5	1,268	3.0	1,852	4.3	2,026	4.7	215	0.5	3.3	0.4
	1988	4,926	12.5	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	2.8	0.4
Communication and control:													
Local area network for technical data . .	1993	12,520	29.3	4,298	10.0	5,126	12.0	2,584	6.0	512	1.2	2.1	0.6
	1988	7,472	18.9	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	2.2	0.4
Local area network for factory use . . . .	1993	9,464	22.1	3,318	7.8	3,492	8.2	2,269	5.3	384	0.9	2.5	0.5
	1988	6,427	16.2	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	2.4	0.4
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	1993	7,638	17.9	3,187	7.4	2,595	6.1	1,535	3.6	322	0.8	2.9	0.5
	1988	5,858	14.8	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	2.6	0.4
Programmable controllers . . . . .	1993	13,018	30.4	2,245	5.2	4,363	10.2	5,730	13.4	681	1.6	2.1	0.6
	1988	12,697	32.1	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	1.6	0.5
Computers used for control on the factory floor . . . . .	1993	11,522	26.9	3,050	7.1	4,259	10.0	3,678	8.6	535	1.3	2.3	0.6
	1988	10,785	27.3	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	1.8	0.5

Note: Data may not add to totals due to the independent rounding of individual figures.

(X) Not applicable.

<sup>1</sup>"Not specified" includes data for nonrespondents.<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 2B. NUMBER AND PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES

Technology	Year	Used in operations		Plan to use within						Not specified <sup>1</sup>		Absolute standard error of "Used in operations" <sup>2</sup> (percent) <sup>2</sup>	
				The next 2 years		2 to 5 years		No plans to use					
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Design and engineering:													
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	1993	25,139	58.8	1,949	4.6	2,115	4.9	10,071	23.5	3,512	8.2	1.3	0.7
	1988	15,436	39.0	4,117	10.4	3,641	9.2	(X)	(X)	3,338	8.4	1.4	0.6
CAD output used to control manufacturing machines . . . . .	1993	10,961	25.6	2,807	6.6	3,738	8.7	21,175	49.5	4,119	9.6	2.5	0.6
	1988	6,680	16.9	3,567	9.0	4,797	12.1	(X)	(X)	3,562	9.0	2.7	0.5
Digital representation of CAD output used in procurement . . . . .	1993	4,850	11.3	2,028	4.7	3,035	7.1	28,152	65.8	4,722	11.0	4.0	0.4
	1988	3,924	9.9	2,670	6.7	4,283	10.8	(X)	(X)	3,738	9.5	3.5	0.3
Fabrication/machining and assembly:													
Flexible manufacturing cells or systems .	1993	5,437	12.7	1,769	4.1	2,399	5.6	28,865	67.5	4,317	10.1	3.3	0.4
	1988	4,217	10.7	1,683	4.3	2,861	7.2	(X)	(X)	3,764	9.5	3.1	0.3
Numerically controlled or computer numerically controlled machines . . . . .	1993	20,078	46.9	1,059	2.5	1,611	3.8	16,279	38.0	3,759	8.8	1.5	0.7
	1988	16,368	41.4	1,135	2.9	1,966	5.0	(X)	(X)	3,432	8.7	1.4	0.6
Materials working lasers . . . . .	1993	2,120	5.0	967	2.3	2,074	4.8	33,315	77.9	4,310	10.1	5.5	0.3
	1988	1,716	4.3	924	2.3	2,687	6.8	(X)	(X)	3,591	9.1	4.9	0.2
Pick and place robots . . . . .	1993	3,679	8.6	1,571	3.7	2,033	4.8	31,222	73.0	4,281	10.0	3.3	0.3
	1988	3,057	7.7	1,658	4.2	3,175	8.0	(X)	(X)	3,534	8.9	2.9	0.2
Other robots . . . . .	1993	2,035	4.8	1,340	3.1	1,886	4.4	33,103	77.4	4,422	10.3	4.1	0.2
	1988	2,246	5.7	1,295	3.3	3,129	7.9	(X)	(X)	3,639	9.2	3.8	0.2
Automated material handling:													
Automatic storage and retrieval systems . . . . .	1993	1,121	2.6	479	1.1	1,443	3.4	35,567	83.1	4,175	9.8	5.6	0.1
	1988	1,252	3.2	616	1.6	1,670	4.2	(X)	(X)	3,456	8.7	5.0	0.2
Automatic guided vehicle systems . . . . .	1993	471	1.1	242	0.6	658	1.5	37,169	86.9	4,246	9.9	6.6	0.1
	1988	596	1.5	322	0.8	1,190	3.0	(X)	(X)	3,454	8.7	6.9	0.1
Automatic sensor-based inspection or testing:													
Performed on incoming or in-process materials . . . . .	1993	4,230	9.9	1,545	3.6	2,661	6.2	30,117	70.4	4,233	9.9	3.7	0.4
	1988	3,937	10.0	1,598	4.0	3,111	7.9	(X)	(X)	3,531	8.9	3.1	0.3
Performed on final product . . . . .	1993	5,360	12.5	1,871	4.4	2,765	6.5	28,537	66.7	4,251	9.9	3.3	0.4
	1988	4,926	12.5	1,786	4.5	3,107	7.9	(X)	(X)	3,489	8.8	2.8	0.4
Communication and control:													
Local area network for technical data . .	1993	12,520	29.3	3,645	8.5	2,820	6.6	19,741	46.1	4,069	9.5	2.1	0.6
	1988	7,472	18.9	3,608	9.1	3,193	8.1	(X)	(X)	3,592	9.1	2.2	0.4
Local area network for factory use . . . .	1993	9,464	22.1	4,222	9.9	3,740	8.7	21,199	49.5	4,161	9.7	2.5	0.5
	1988	6,427	16.2	3,621	9.2	3,919	9.9	(X)	(X)	3,601	9.1	2.4	0.4
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	1993	7,638	17.9	3,608	8.4	4,459	10.4	22,861	53.4	4,228	9.9	2.9	0.5
	1988	5,858	14.8	3,135	7.9	4,918	12.4	(X)	(X)	3,614	9.1	2.6	0.4
Programmable controllers . . . . .	1993	13,018	30.4	1,655	3.9	2,026	4.7	21,925	51.2	4,166	9.7	2.1	0.6
	1988	12,697	32.1	1,823	4.6	2,419	6.1	(X)	(X)	3,525	8.9	1.6	0.5
Computers used for control on the factory floor . . . . .	1993	11,522	26.9	3,958	9.3	3,750	8.8	19,553	45.7	4,008	9.4	2.3	0.6
	1988	10,785	27.3	4,229	10.7	4,473	11.3	(X)	(X)	3,485	8.8	1.8	0.5

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero. (X) Not applicable.

<sup>1</sup>"Not specified" includes data for nonrespondents.<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 3. NUMBER OF ESTABLISHMENTS BY NUMBER OF TECHNOLOGIES USED OR PLANNED

Number of technologies	Number of establishments currently using	Number of establishments planning to use additional technology within 5 years						Relative standard error of "Currently using" (percent) <sup>1</sup>
		Number of technologies planned:						
		0	1	2	3 to 4	5 to 10	11 to 17	
0.....	10,715	8,292	847	590	442	494	47	2.7
1.....	5,540	2,977	589	507	762	638	67	4.2
2.....	4,753	2,322	507	382	698	789	55	4.4
3.....	5,218	2,058	775	360	864	1,076	85	4.2
4.....	4,253	1,273	687	526	846	884	37	4.7
5.....	3,458	959	487	541	872	598	1	5.1
6.....	2,450	756	334	382	474	488	16	5.5
7.....	2,052	578	335	301	504	334	-	5.8
8.....	1,572	414	298	267	367	226	-	6.7
9.....	1,106	243	238	228	231	166	-	7.4
10.....	710	181	164	158	166	41	-	6.7
11.....	508	158	124	103	91	32	-	9.3
12.....	275	96	50	61	56	12	-	9.6
13.....	172	68	63	19	22	-	-	10.1
14.....	110	52	38	20	-	-	-	10.6
15.....	60	40	13	5	-	-	2	14.3
16.....	29	22	7	-	-	-	-	14.8
17.....	10	10	-	-	-	-	-	27.5

- Represents zero.

<sup>1</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 4A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MAJOR GROUPS 34 TO 38

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>	
			When technology was first implemented				Plan to use within			Not specified		
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use			
MAJOR GROUP 34												
Fabricated Metal Products												
Design and engineering:												
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	46.5	30,373	12.9	20.3	12.7	0.7	5.1	5.9	32.1	10.3	1.6	
CAD output used to control manufacturing machines . . . . .	19.3	6,623	4.7	8.7	5.7	0.1	6.0	8.8	54.5	11.5	1.2	
Digital representation of CAD output used in procurement . . . . .	7.0	-	2.5	3.4	0.9	0.3	3.7	6.3	70.6	12.4	0.8	
Fabrication/machining and assembly:												
Flexible manufacturing cells or systems . . . . .	9.5	-	2.8	3.4	3.1	0.3	4.2	5.4	68.9	12.0	0.7	
Numerically controlled or computer numerically controlled machines . . . . .	40.4	28,926	4.2	11.1	23.9	1.2	2.5	5.3	41.0	10.8	1.5	
Materials working lasers . . . . .	3.4	711	1.1	0.8	1.3	0.2	1.9	6.1	76.5	12.1	0.5	
Pick and place robots . . . . .	6.6	5,148	1.5	2.4	2.7	0.1	4.1	5.4	72.0	11.9	0.5	
Other robots . . . . .	3.8	2,839	0.8	1.5	1.3	0.1	3.2	4.4	76.3	12.3	0.4	
Automated material handling:												
Automatic storage and retrieval systems . . . . .	1.2	-	0.3	0.7	0.3	-	0.9	3.2	83.2	11.5	0.2	
Automatic guided vehicle systems . . . . .	0.3	-	0.1	0.2	0.1	-	0.5	1.3	86.1	11.8	0.1	
Automatic sensor-based inspection or testing:												
Performed on incoming or in-process materials . . . . .	8.1	-	2.1	2.9	2.6	0.4	3.3	5.8	71.4	11.3	0.7	
Performed on final product . . . . .	9.6	-	2.4	3.4	3.2	0.6	4.1	6.6	68.0	11.7	0.7	
Communication and control:												
Local area network for technical data . . . . .	20.1	-	7.4	7.7	4.0	1.0	8.0	5.5	55.4	11.0	1.2	
Local area network for factory use . . . . .	14.5	-	5.4	4.9	3.8	0.4	8.9	8.6	56.6	11.3	1.0	
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	16.7	-	6.9	5.4	3.9	0.4	8.0	8.1	54.9	12.3	1.1	
Programmable controllers . . . . .	30.2	49,045	4.9	10.9	12.6	1.7	3.2	4.2	50.8	11.6	1.3	
Computers used for control on the factory floor . . . . .	20.2	12,226	6.1	6.8	6.2	1.1	9.2	9.6	49.7	11.3	1.1	
MAJOR GROUP 35												
Industrial Machinery and Equipment												
Design and engineering:												
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	64.1	58,869	11.6	28.9	22.8	0.9	4.1	4.5	19.2	8.0	1.4	
CAD output used to control manufacturing machines . . . . .	34.8	14,151	7.5	14.5	12.3	0.5	7.1	9.1	39.5	9.5	1.4	
Digital representation of CAD output used in procurement . . . . .	11.6	-	3.5	4.7	3.0	0.5	5.4	6.8	64.0	12.1	0.9	
Fabrication/machining and assembly:												
Flexible manufacturing cells or systems . . . . .	11.8	-	3.2	4.6	3.6	0.4	3.8	5.2	69.2	10.1	0.8	
Numerically controlled or computer numerically controlled machines . . . . .	61.9	90,726	4.6	14.3	41.6	1.3	2.1	2.4	25.3	8.4	1.3	
Materials working lasers . . . . .	4.3	1,429	1.5	1.1	1.5	0.2	2.4	4.8	78.3	10.3	0.5	
Pick and place robots . . . . .	5.4	4,672	1.4	1.5	2.2	0.2	2.5	3.2	78.6	10.3	0.5	
Other robots . . . . .	3.6	1,817	0.6	1.5	1.4	0.2	2.5	3.8	79.7	10.4	0.3	

See footnotes at the end of the table.

Table 4A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MAJOR GROUPS 34 TO 38—Continued

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>MAJOR GROUP 35—Cont.</b>											
<b>Industrial Machinery and Equipment—Cont.</b>											
Automated material handling:											
Automatic storage and retrieval systems .....	2.3	-	0.6	0.5	1.1	0.2	0.9	2.4	84.6	9.9	0.3
Automatic guided vehicle systems .....	1.1	-	0.1	0.3	0.5	0.2	0.5	1.0	87.3	10.1	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials .....	8.1	-	2.0	2.7	3.3	0.2	3.2	5.4	73.2	10.1	0.7
Performed on final product .....	10.6	-	2.7	3.7	4.0	0.2	4.0	5.9	69.5	10.0	0.8
Communication and control:											
Local area network for technical data .....	29.4	-	9.7	12.4	6.2	1.0	7.7	6.9	46.2	9.8	1.2
Local area network for factory use .....	21.0	-	7.0	8.5	4.9	0.7	9.1	9.4	50.5	10.0	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	15.4	-	6.6	5.7	2.7	0.5	7.5	12.5	55.0	9.5	1.0
Programmable controllers .....	29.0	41,937	4.6	10.1	12.8	1.5	4.3	5.5	51.5	9.8	1.2
Computers used for control on the factory floor .....	28.1	21,953	7.4	10.8	8.8	1.1	9.1	8.4	45.0	9.4	1.2
<b>MAJOR GROUP 36</b>											
<b>Electronic and Other Electric Equipment</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) .....	64.2	35,907	11.6	29.2	22.5	0.9	4.2	4.1	17.8	9.7	1.3
CAD output used to control manufacturing machines .....	21.5	7,742	4.5	10.6	6.0	0.4	5.8	7.1	54.0	11.6	1.1
Digital representation of CAD output used in procurement .....	16.1	-	4.9	7.3	3.7	0.2	5.0	6.9	59.9	12.1	1.0
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems .....	17.0	-	5.6	6.0	4.9	0.5	4.0	4.9	62.5	11.7	0.9
Numerically controlled or computer numerically controlled machines .....	34.5	19,684	3.4	8.5	21.4	1.2	2.4	3.2	49.1	10.8	1.3
Materials working lasers .....	7.8	4,341	2.1	2.0	3.5	0.3	1.7	3.1	75.8	11.5	0.7
Pick and place robots .....	15.2	13,809	3.3	5.6	5.9	0.4	4.8	6.7	62.0	11.2	0.8
Other robots .....	5.3	5,083	1.0	2.0	2.1	0.2	4.1	4.9	73.9	11.8	0.4
Automated material handling:											
Automatic storage and retrieval systems .....	3.8	-	0.6	1.6	1.5	0.1	1.7	4.2	79.0	11.3	0.3
Automatic guided vehicle systems .....	1.7	-	0.3	0.7	0.6	-	0.7	2.4	83.9	11.3	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials .....	11.8	-	2.5	4.8	4.0	0.8	4.7	7.7	83.8	12.0	0.7
Performed on final product .....	17.5	-	3.9	6.0	7.0	0.6	5.1	8.9	58.9	11.5	1.0
Communication and control:											
Local area network for technical data .....	37.1	-	13.0	15.2	7.4	1.5	9.9	8.0	33.8	11.1	1.2
Local area network for factory use .....	30.5	-	11.3	10.3	7.3	1.8	11.2	8.8	38.2	11.4	1.2
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	21.9	-	9.7	6.4	4.6	1.3	9.8	10.4	46.5	11.4	1.0
Programmable controllers .....	30.7	48,504	5.6	9.2	14.4	1.5	3.5	5.0	49.3	11.4	1.1
Computers used for control on the factory floor .....	33.2	28,401	7.4	12.3	11.9	1.5	9.9	7.8	38.5	10.7	1.2

See footnotes at the end of the table.

Table 4A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MAJOR GROUPS 34 TO 38—Continued

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>MAJOR GROUP 37</b>											
<b>Transportation Equipment</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	53.9	29,604	12.0	22.2	18.3	1.3	5.3	4.8	26.5	9.5	1.6
CAD output used to control manufacturing machines . . . . .	25.5	6,705	6.7	8.5	9.6	0.7	6.2	9.4	48.3	10.7	1.3
Digital representation of CAD output used in procurement . . . . .	9.6	-	4.0	4.0	1.1	0.5	5.3	9.4	63.8	11.8	0.9
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems . . . . .	15.5	-	5.4	5.0	4.8	0.3	4.5	7.1	61.3	11.6	1.1
Numerically controlled or computer numerically controlled machines . . . . .	44.1	21,966	4.7	11.7	26.1	1.6	2.9	3.2	40.0	9.8	1.5
Materials working lasers . . . . .	5.4	833	1.6	1.6	2.0	0.1	3.3	4.2	76.0	11.1	0.5
Pick and place robots . . . . .	10.1	5,177	2.0	3.2	4.7	0.3	3.6	3.8	71.4	11.0	0.8
Other robots . . . . .	11.7	10,128	2.5	3.8	5.2	0.2	2.7	4.6	69.3	11.7	0.9
Automated material handling:											
Automatic storage and retrieval systems . . . . .	3.8	-	0.6	1.0	2.1	0.1	0.8	3.9	80.4	11.1	0.3
Automatic guided vehicle systems . . . . .	2.2	-	0.3	0.6	1.3	-	1.0	2.3	83.4	11.1	0.3
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials . . . . .	15.6	-	3.2	5.4	6.4	0.6	3.5	5.4	64.7	10.8	1.0
Performed on final product . . . . .	16.2	-	3.1	5.5	6.8	0.8	4.4	5.2	63.2	10.9	1.0
Communication and control:											
Local area network for technical data . . . . .	28.0	-	9.4	10.7	6.8	1.1	7.8	5.9	47.4	10.9	1.3
Local area network for factory use . . . . .	23.9	-	8.2	8.7	6.2	0.7	9.6	6.8	48.8	10.9	1.2
Intercompany computer network linking plant to subcontractors, supplies, and/or customers . . . . .	23.4	-	8.0	9.0	5.0	1.5	7.0	10.2	48.6	10.8	1.2
Programmable controllers . . . . .	30.7	54,063	4.5	9.0	15.8	1.3	3.2	3.1	51.8	11.2	1.3
Computers used for control on the factory floor . . . . .	26.8	22,933	7.8	10.0	7.8	1.3	8.2	7.5	46.6	10.8	1.2
<b>MAJOR GROUP 38</b>											
<b>Instruments and Related Products</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	65.5	24,712	12.8	30.2	21.5	1.0	3.3	4.3	17.8	9.1	1.5
CAD output used to control manufacturing machines . . . . .	18.5	2,827	5.3	6.6	6.0	0.5	7.1	8.2	56.1	10.2	1.1
Digital representation of CAD output used in procurement . . . . .	16.1	-	6.5	5.9	3.1	0.6	3.8	7.6	61.7	10.8	1.1
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems . . . . .	14.2	-	4.7	5.5	3.7	0.4	4.2	6.3	64.8	10.4	1.0
Numerically controlled or computer numerically controlled machines . . . . .	35.1	10,469	5.0	8.9	20.3	0.9	2.3	4.2	48.8	9.6	1.5
Materials working lasers . . . . .	6.3	532	1.6	1.4	3.0	0.4	2.5	4.1	76.9	10.2	0.6

See footnotes at the end of the table.



Table 4A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MAJOR GROUPS 34 TO 38—Continued**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>MAJOR GROUP 38—Cont.</b>											
<b>Instruments and Related Products—Cont.</b>											
Pick and place robots . . . . .	11.7	2,707	2.3	5.0	3.9	0.4	3.5	4.8	69.8	10.3	0.8
Other robots. . . . .	3.8	839	1.0	1.1	1.5	0.2	3.6	4.7	77.5	10.5	0.4
Automated material handling:											
Automatic storage and retrieval systems . . . . .	4.8	-	1.1	1.6	1.9	0.2	1.6	5.0	78.3	10.2	0.4
Automatic guided vehicle systems . . . . .	1.5	-	0.2	0.6	0.7	-	0.4	1.6	86.1	10.5	0.3
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	11.7	-	3.4	3.7	4.4	0.3	3.7	7.2	66.7	10.7	0.8
Performed on final product . . . . .	14.7	-	3.6	4.5	5.8	0.8	4.4	7.1	62.9	10.9	1.0
Communication and control:											
Local area network for technical data . . . . .	40.7	-	13.7	16.6	8.4	2.0	9.6	6.3	33.3	10.2	1.5
Local area network for factory use . . . . .	30.0	-	9.5	11.8	6.9	1.9	11.8	8.1	39.7	10.4	1.4
Intercompany computer network linking plant to subcontractors, supplies, and/or customers. . . . .	15.3	-	6.8	5.3	2.2	1.1	10.2	9.9	54.0	10.5	1.0
Programmable controllers . . . . .	29.8	20,829	5.8	10.0	12.1	2.0	4.4	4.2	51.7	10.0	1.4
Computers used for control on the factory floor . . . . .	29.0	10,352	6.5	11.5	9.4	1.7	8.7	7.6	44.5	10.3	1.3

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 4B. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MAJOR GROUPS 34 TO 38

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>MAJOR GROUP 34</b>							
<b>Fabricated Metal Products</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE).....	46.5	20.8	19.6	2.7	2.5	1.2	1.6
CAD output used to control manufacturing machines.....	19.3	9.0	7.2	1.4	0.9	1.0	1.2
Digital representation to CAD output used in procurement.....	7.0	3.9	2.0	0.6	0.3	0.3	0.8
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems ..	9.5	2.5	4.4	1.9	0.3	0.5	0.7
Numerically controlled or computer numerically controlled machines.....	40.4	14.9	16.6	4.8	1.6	2.8	1.5
Materials working lasers.....	3.4	1.3	1.2	0.2	0.5	0.3	0.5
Pick and place robots.....	6.6	1.0	2.9	2.1	0.2	0.3	0.5
Other robots.....	3.8	0.8	1.7	0.9	0.2	0.2	0.4
Automated material handling:							
Automatic storage and retrieval systems..	1.2	0.2	0.6	0.2	0.2	-	0.2
Automatic guided vehicle systems.....	0.3	-	0.1	0.2	0.1	-	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials.....	8.1	6.6	0.5	0.2	0.4	0.4	0.7
Performed on final product.....	9.6	7.8	0.5	0.2	0.2	0.9	0.7
Communication and control:							
Local area network for technical data....	20.1	6.2	7.7	1.5	2.7	1.9	1.2
Local area network for factory use.....	14.5	4.8	5.3	0.8	2.4	1.2	1.0
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers.....	16.7	3.6	4.3	2.3	5.2	1.3	1.1
Programmable controllers.....	30.2	10.7	11.2	2.7	3.0	2.9	1.3
Computers used for control on the factory floor.....	20.2	7.6	6.5	2.0	2.3	2.1	1.1
<b>MAJOR GROUP 35</b>							
<b>Industrial Machinery and Equipment</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE).....	64.1	27.8	27.5	3.4	3.3	2.5	1.4
CAD output used to control manufacturing machines.....	34.8	13.5	15.3	3.4	1.0	1.9	1.4
Digital representation of CAD output used in procurement.....	11.6	5.0	4.2	1.2	0.9	0.4	0.9
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems ..	11.8	3.1	5.3	1.9	0.8	0.8	0.8
Numerically controlled or computer numerically controlled machines.....	61.9	20.8	29.3	8.2	1.5	3.1	1.3
Materials working lasers.....	4.3	1.6	1.1	0.5	0.8	0.4	0.5
Pick and place robots.....	5.4	0.8	2.4	1.8	0.1	0.4	0.5
Other robots.....	3.6	0.7	1.5	1.0	0.2	0.3	0.3
Automated material handling:							
Automatic storage and retrieval systems..	2.3	0.2	0.8	0.6	0.6	0.1	0.3
Automatic guided vehicle systems.....	1.1	0.1	0.3	0.3	0.1	0.2	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials.....	8.1	6.9	0.5	0.2	0.3	0.3	0.7

See footnotes at the end of the table.

Table 4B. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MAJOR GROUPS 34 TO 38—Continued**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>MAJOR GROUP 35—Cont.</b>							
<b>Industrial Machinery and Equipment—Cont.</b>							
Performed on final product.....	10.6	8.5	0.9	0.4	0.5	0.3	0.8
Communication and control:							
Local area network for technical data . . . .	29.4	8.1	13.2	1.9	4.6	1.6	1.2
Local area network for factory use.....	21.0	4.9	9.7	1.5	3.7	1.2	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers.....	15.4	4.8	3.8	1.8	4.1	1.0	1.0
Programmable controllers.....	29.0	10.8	10.2	2.3	3.1	3.0	1.2
Computers used for control on the factory floor.....	28.1	10.3	9.6	2.9	3.4	2.2	1.2
<b>MAJOR GROUP 36</b>							
<b>Electronic and Other Electric Equipment</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE).....	64.2	27.8	27.6	3.9	3.0	2.3	1.3
CAD output used to control manufacturing machines.....	21.5	10.2	7.4	2.0	1.2	1.0	1.1
Digital representation of CAD output used in procurement.....	16.1	8.9	4.3	1.0	1.5	0.5	1.0
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems ..	17.0	5.8	5.4	3.3	1.6	1.1	0.9
Numerically controlled or computer numerically controlled machines.....	34.5	13.3	13.2	4.7	1.3	2.5	1.3
Materials working lasers.....	7.8	4.3	1.2	1.1	0.7	0.5	0.7
Pick and place robots.....	15.2	3.5	5.0	5.0	0.7	1.1	0.8
Other robots.....	5.3	1.7	1.2	1.9	0.2	0.4	0.4
Automated material handling:							
Automatic storage and retrieval systems..	3.8	0.7	1.5	0.8	0.5	0.2	0.3
Automatic guided vehicle systems.....	1.7	0.1	0.6	0.5	0.3	0.1	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials.....	11.8	8.7	1.0	0.8	0.1	1.2	0.7
Performed on final product.....	17.5	12.5	1.9	1.5	0.5	1.3	1.0
Communication and control:							
Local area network for technical data . . . .	37.1	10.7	16.6	2.3	4.8	2.9	1.2
Local area network for factory use.....	30.5	9.7	11.4	2.5	4.3	2.7	1.2
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers.....	21.9	6.4	5.8	2.0	5.8	1.9	1.0
Programmable controllers.....	30.7	13.4	8.4	3.0	3.6	2.6	1.1
Computers used for control on the factory floor.....	33.2	13.9	9.4	3.0	4.2	2.8	1.2
<b>MAJOR GROUP 37</b>							
<b>Transportation Equipment</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE).....	53.9	22.8	22.2	2.8	3.7	2.4	1.6
CAD output used to control manufacturing machines.....	25.5	10.1	10.9	2.5	1.1	1.1	1.3
Digital representation of CAD output used in procurement.....	9.6	4.9	2.2	0.6	1.0	0.9	0.9
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems ..	15.5	3.9	6.3	3.4	1.4	0.6	1.1
See footnotes at the end of the table.							

See footnotes at the end of the table.

Table 4B. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MAJOR GROUPS 34 TO 38—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>MAJOR GROUP 37—Cont.</b>							
<b>Transportation Equipment—Cont.</b>							
Numerically controlled or computer numerically controlled machines . . . . .	44.1	17.0	16.7	5.7	1.9	3.5	1.5
Materials working lasers . . . . .	5.4	3.1	0.8	0.8	0.6	0.1	0.5
Pick and place robots . . . . .	10.1	1.4	3.9	4.3	0.2	0.3	0.8
Other robots . . . . .	11.7	5.3	2.5	3.1	0.5	0.4	0.9
Automated material handling:							
Automatic storage and retrieval systems . .	3.8	0.2	1.1	1.9	0.5	0.1	0.3
Automatic guided vehicle systems . . . . .	2.2	0.3	0.3	1.1	0.4	-	0.3
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	15.6	11.8	1.4	0.7	0.4	1.3	1.0
Performed on final product . . . . .	16.2	12.8	0.8	0.9	0.5	1.3	1.0
Communication and control:							
Local area network for technical data . . .	28.0	8.1	11.3	2.0	4.2	2.6	1.3
Local area network for factory use . . . . .	23.9	7.8	8.2	2.5	3.3	2.2	1.2
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	23.4	6.4	6.5	1.9	6.4	2.1	1.2
Programmable controllers . . . . .	30.7	10.8	10.1	2.2	5.3	2.4	1.3
Computers used for control on the factory floor . . . . .	26.8	10.1	8.1	2.4	4.2	2.2	1.2
<b>MAJOR GROUP 38</b>							
<b>Instruments and Related Products</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	65.5	27.7	29.0	2.5	3.3	3.2	1.5
CAD output used to control manufacturing machines . . . . .	18.5	8.0	7.2	1.8	0.5	1.2	1.1
Digital representation of CAD output used in procurement . . . . .	16.1	10.1	2.8	1.3	1.1	0.7	1.1
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems . .	14.2	4.6	4.5	3.6	0.5	1.1	1.0
Numerically controlled or computer numerically controlled machines . . . . .	35.1	13.5	12.9	5.0	1.3	2.7	1.5
Materials working lasers . . . . .	6.3	3.9	1.0	0.6	0.5	0.2	0.6
Pick and place robots . . . . .	11.7	2.8	3.8	4.5	0.2	0.7	0.8
Other robots . . . . .	3.8	0.9	0.8	1.8	0.1	0.3	0.4
Automated material handling:							
Automatic storage and retrieval systems . .	4.8	0.8	1.9	1.1	0.6	0.5	0.4
Automatic guided vehicle systems . . . . .	1.5	0.2	0.5	0.7	0.1	0.1	0.3
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	11.7	8.4	1.6	0.7	0.2	0.8	0.8
Performed on final product . . . . .	14.7	10.7	1.8	1.0	0.3	1.1	1.0
Communication and control:							
Local area network for technical data . . .	40.7	12.3	15.3	2.7	5.6	4.9	1.5
Local area network for factory use . . . . .	30.0	10.0	10.5	2.9	3.8	2.9	1.4
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	15.3	4.7	3.6	1.5	3.6	2.1	1.0
Programmable controllers . . . . .	29.8	12.6	7.1	3.5	3.6	3.2	1.4
Computers used for control on the factory floor . . . . .	29.0	11.6	10.0	2.7	2.1	3.1	1.3

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 4C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY EMPLOYMENT SIZE

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" <sup>1</sup> (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>EMPLOYMENT SIZE 20 TO 99</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	49.5	56,340	12.3	22.8	13.5	0.9	4.7	5.8	29.7	10.2	1.0
CAD output used to control manufacturing machines . . . . .	22.0	15,712	5.0	9.6	7.0	0.4	5.5	8.0	52.9	11.6	0.9
Digital representation of CAD output used in procurement . . . . .	8.9	-	3.0	4.0	1.5	0.4	3.6	5.6	68.8	13.1	0.6
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	7.6	-	2.3	2.9	2.2	0.2	3.0	4.7	72.6	12.1	0.5
Numerically controlled or computer numerically controlled machines . . . . .	41.4	81,323	4.2	10.9	25.2	1.1	2.4	3.9	41.5	10.8	0.9
Materials working lasers. . . . .	2.8	1,500	1.0	0.5	1.1	0.2	1.7	4.3	79.1	12.1	0.3
Pick and place robots . . . . .	3.6	4,375	1.2	1.4	1.0	0.1	2.6	3.5	78.2	12.1	0.3
Other robots. . . . .	1.3	1,057	0.4	0.6	0.3	0.1	2.4	3.0	81.0	12.3	0.2
Automated material handling:											
Automatic storage and retrieval systems . . . . .	0.6	-	0.2	0.2	0.1	-	0.4	2.1	85.0	11.8	0.2
Automatic guided vehicle systems . . . . .	0.3	-	-	0.1	0.1	0.1	0.3	0.7	86.7	12.0	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	5.5	-	1.5	2.0	1.7	0.3	2.9	5.5	74.2	11.9	0.5
Performed on final product . . . . .	7.9	-	2.2	2.8	2.6	0.4	3.8	5.8	70.5	11.9	0.5
Communication and control:											
Local area network for technical data . . . . .	20.5	-	7.5	8.6	3.5	0.9	7.5	6.9	53.6	11.5	0.8
Local area network for factory use . . . . .	14.6	-	5.6	5.3	3.1	0.7	8.2	8.7	56.6	11.8	0.7
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	12.0	-	5.3	3.8	2.4	0.6	6.7	9.6	59.8	11.9	0.7
Programmable controllers . . . . .	20.5	32,796	4.1	7.3	7.9	1.2	3.6	5.0	59.0	11.9	0.8
Computers used for control on the factory floor . . . . .	18.8	19,569	5.8	6.7	5.5	0.9	9.0	8.7	52.0	11.4	0.8
<b>EMPLOYMENT SIZE 100 TO 499</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	76.4	53,423	12.9	34.4	28.5	0.6	4.5	3.1	9.5	6.6	0.7
CAD output used to control manufacturing machines . . . . .	30.5	10,602	7.8	12.8	9.5	0.4	8.9	10.6	41.9	8.2	0.8
Digital representation of CAD output used in procurement . . . . .	14.1	-	5.2	5.5	3.2	0.2	7.2	10.5	58.9	9.4	0.5
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems . . . . .	21.4	-	7.6	7.5	5.7	0.6	6.7	7.8	55.6	8.6	0.7
Numerically controlled or computer numerically controlled machines . . . . .	56.5	53,341	4.8	13.4	36.9	1.5	2.1	3.5	30.6	7.3	0.8
Materials working lasers. . . . .	7.5	1,680	2.4	2.2	2.7	0.3	3.2	5.7	75.0	8.6	0.5
Pick and place robots . . . . .	15.9	10,041	3.4	5.7	6.3	0.5	6.3	7.8	61.7	8.3	0.6
Other robots. . . . .	9.5	4,811	2.0	4.1	3.1	0.3	4.6	7.6	69.2	9.0	0.5
Automated material handling:											
Automatic storage and retrieval systems . . . . .	4.1	-	1.0	1.6	1.3	0.2	2.5	6.0	79.3	8.1	0.3
Automatic guided vehicle systems. . . . .	1.3	-	0.3	0.5	0.4	0.1	1.1	2.8	86.4	8.4	0.2

See footnotes at the end of the table.

Table 4C. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY EMPLOYMENT SIZE—Continued**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>EMPLOYMENT SIZE 100 TO 499—Cont.</b>											
Automatic sensor based inspection or testing:											
Performed on incoming or in-process materials. . . . .	16.4	-	4.3	5.9	5.6	0.6	5.5	7.9	61.9	8.3	0.6
Performed on final product . . . . .	20.0	-	4.9	6.9	7.5	0.8	5.7	7.6	58.1	8.6	0.6
Communication and control:											
Local area network for technical data . . . . .	44.1	-	15.6	17.5	9.4	1.6	11.5	6.3	29.8	8.2	0.8
Local area network for factory use . . . . .	34.3	-	12.4	12.6	8.1	1.2	13.9	9.3	34.4	8.1	0.8
Intercompany computer network linking plant to subcontractors, supplies, and/or customers . . . . .	28.4	-	12.0	10.1	5.3	1.1	12.4	12.2	38.6	8.3	0.7
Programmable controllers . . . . .	49.1	69,142	7.7	16.8	22.2	2.4	4.5	4.2	34.2	8.0	0.8
Computers used for control on the factory floor . . . . .	41.8	34,132	9.9	16.8	13.1	2.0	10.1	8.6	31.6	7.8	0.8
<b>EMPLOYMENT SIZE 500 AND OVER</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	87.2	69,703	6.2	26.5	53.3	1.3	1.0	0.3	3.8	7.8	0.5
CAD output used to control manufacturing machines . . . . .	48.1	11,733	7.7	17.4	22.2	0.9	7.6	7.2	28.3	8.8	0.8
Digital representation of CAD output used in procurement. . . . .	30.3	-	8.0	12.7	8.8	0.8	7.4	10.2	42.5	9.6	0.8
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems . . . . .	40.1	-	7.8	14.3	16.9	1.2	6.6	6.1	38.0	9.1	0.8
Numerically controlled or computer numerically controlled machines . . . . .	67.1	37,108	4.3	12.6	48.2	1.9	2.3	1.3	21.0	8.2	0.8
Materials working lasers. . . . .	22.6	4,666	4.7	7.0	10.6	0.3	4.6	7.4	56.1	9.4	0.7
Pick and place robots . . . . .	42.8	17,096	4.9	12.6	23.9	1.3	4.2	6.5	37.8	8.7	0.8
Other robots. . . . .	29.6	14,838	3.1	7.9	18.0	0.6	5.6	7.9	46.9	10.0	0.7
Automated material handling:											
Automatic storage and retrieval systems . . . . .	23.6	-	3.0	6.6	13.4	0.6	3.1	7.8	56.9	8.8	0.7
Automatic guided vehicle systems . . . . .	11.8	-	1.3	4.1	6.1	0.4	1.8	6.3	71.1	9.0	0.6
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	39.1	-	5.3	12.1	20.9	0.8	4.3	6.3	41.1	9.2	0.8
Performed on final product . . . . .	38.8	-	4.7	11.4	21.5	1.2	4.5	7.3	40.2	9.1	0.8
Communication and control:											
Local area network for technical data . . . . .	72.5	-	17.2	27.3	25.2	2.7	6.0	2.3	11.3	8.0	0.7
Local area network for factory use . . . . .	63.4	-	13.6	25.3	22.5	2.0	10.5	4.5	13.3	8.3	0.8
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	47.1	-	15.3	17.6	12.5	1.7	11.1	11.0	21.9	8.9	0.8
Programmable controllers . . . . .	69.8	112,440	4.4	17.0	45.5	2.9	2.4	1.9	16.9	8.9	0.7
Computers used for control on the factory floor . . . . .	62.8	42,164	10.1	21.3	28.6	2.8	5.6	5.0	18.1	8.5	0.8

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 4D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY EMPLOYMENT SIZE**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>EMPLOYMENT SIZE 20 TO 99</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	49.5	23.1	20.0	2.5	2.5	1.8	1.0
CAD output used to control manufacturing machines . . . . .	22.0	9.4	8.8	2.0	0.7	1.3	0.9
Digital representation of CAD output used in procurement. . . . .	8.9	4.5	2.7	0.7	0.7	0.3	0.6
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems. . . . .	7.6	2.1	3.2	1.4	0.5	0.5	0.5
Numerically controlled or computer numerically controlled machines . . . . .	41.4	14.2	18.7	5.0	1.4	2.7	0.9
Materials working lasers. . . . .	2.8	1.0	0.8	0.3	0.6	0.2	0.3
Pick and place robots. . . . .	3.6	0.6	1.7	0.9	0.2	0.2	0.3
Other robots. . . . .	1.3	0.3	0.6	0.3	0.1	0.1	0.2
Automated material handling:							
Automatic storage and retrieval systems. . . . .	0.6	0.1	0.2	-	0.2	-	0.2
Automatic guided vehicle systems. . . . .	0.3	-	0.1	-	0.1	-	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	5.5	4.5	0.3	0.1	0.2	0.3	0.5
Performed on final product . . . . .	7.9	6.3	0.5	0.2	0.3	0.6	0.5
Communication and control:							
Local area network for technical data. . . . .	20.5	5.9	8.8	1.4	2.7	1.8	0.8
Local area network for factory use . . . . .	14.6	4.1	6.1	0.9	2.4	1.2	0.7
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	12.0	3.1	2.8	1.4	3.5	1.0	0.7
Programmable controllers . . . . .	20.5	7.9	6.8	1.7	2.3	2.1	0.8
Computers used for control on the factory floor . . . . .	18.8	7.3	6.0	1.7	2.4	1.6	0.8
<b>EMPLOYMENT SIZE 100 TO 499</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	76.4	29.8	35.9	4.0	4.2	3.0	0.7
CAD output used to control manufacturing machines . . . . .	30.5	12.5	13.1	2.3	1.5	1.3	0.8
Digital representation of CAD output used in procurement. . . . .	14.1	7.5	4.3	0.9	0.9	0.5	0.5
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems. . . . .	21.4	6.3	8.6	4.0	1.2	1.5	0.7
Numerically controlled or computer numerically controlled machines . . . . .	56.5	21.8	22.8	7.5	1.9	3.5	0.8
Materials working lasers. . . . .	7.5	4.2	1.6	0.9	0.6	0.4	0.5
Pick and place robots. . . . .	15.9	3.0	5.7	5.9	0.4	1.0	0.6
Other robots. . . . .	9.5	2.7	3.3	2.6	0.3	0.7	0.5
Automated material handling:							
Automatic storage and retrieval systems. . . . .	4.1	0.5	1.7	1.0	0.6	0.3	0.3
Automatic guided vehicle systems. . . . .	1.3	0.1	0.5	0.3	0.2	0.2	0.2

See footnotes at the end of the table.

Table 4D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY EMPLOYMENT SIZE—Continued**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>EMPLOYMENT SIZE 100 TO 499—Cont.</b>							
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	16.4	12.6	1.5	0.8	0.4	1.1	0.6
Performed on final product .....	20.0	15.0	2.0	1.3	0.7	1.2	0.6
Communication and control:							
Local area network for technical data. . .	44.1	13.0	18.8	2.4	6.9	3.2	0.8
Local area network for factory use .....	34.3	10.6	13.0	2.9	5.3	2.8	0.8
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	28.4	7.9	7.7	2.7	7.8	2.4	0.7
Programmable controllers .....	49.1	18.8	16.4	4.2	5.5	4.7	0.8
Computers used for control on the factory floor .....	41.8	15.8	13.3	4.3	4.7	4.0	0.8
<b>EMPLOYMENT SIZE 500 AND OVER</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	87.2	33.2	38.9	8.7	4.3	2.4	0.5
CAD output used to control manufacturing machines .....	48.1	21.0	17.4	6.4	1.8	1.8	0.8
Digital representation of CAD output used in procurement. ....	30.3	16.3	5.6	3.3	3.5	1.5	0.8
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems. Numerically controlled or computer numerically controlled machines .....	40.1	12.2	13.7	9.5	3.3	1.8	0.8
Materials working lasers. ....	67.1	26.3	22.7	12.9	2.4	3.2	0.8
Pick and place robots. ....	22.6	12.6	4.2	2.6	2.3	1.1	0.7
Other robots. ....	42.8	8.4	13.4	17.7	1.2	2.2	0.8
	29.6	10.2	6.5	10.2	1.4	1.7	0.7
Automated material handling:							
Automatic storage and retrieval systems. ....	23.6	2.7	8.5	8.0	3.2	1.2	0.7
Automatic guided vehicle systems. ....	11.8	1.2	2.8	6.0	1.1	0.8	0.6
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	39.1	29.3	3.9	2.6	1.0	2.4	0.8
Performed on final product .....	38.8	29.6	3.8	2.5	0.7	2.4	0.8
Communication and control:							
Local area network for technical data. . .	72.5	21.3	28.4	7.5	10.5	5.0	0.7
Local area network for factory use .....	63.4	19.7	23.5	7.4	8.8	4.2	0.8
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	47.1	14.8	13.4	6.0	9.9	3.2	0.8
Programmable controllers .....	69.8	24.5	23.1	8.8	9.3	4.3	0.7
Computers used for control on the factory floor .....	62.8	24.0	20.8	6.6	6.8	4.8	0.8

Note: Data might not add exactly to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 4E. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY AGE OF PLANT (YEARS)

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>LESS THAN 5 YEARS</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	63.5	22,297	19.0	31.1	12.3	1.0	5.7	4.8	23.7	2.3	2.3
CAD output used to control manufacturing machines . . . . .	21.1	2,448	8.1	9.5	3.2	0.3	6.7	7.3	62.2	2.8	1.9
Digital representation to CAD output used in procurement . . . . .	12.5	-	4.5	6.2	1.4	0.3	5.1	6.6	71.0	4.8	1.3
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	13.4	-	5.7	4.9	2.5	0.2	4.1	6.3	71.5	4.7	1.3
Numerically controlled or computer numerically controlled machines . . . . .	38.4	10,791	6.2	15.8	15.7	0.7	3.8	3.9	51.3	2.6	2.2
Materials working lasers. . . . .	4.0	508	1.6	1.4	0.8	0.2	1.3	4.2	86.4	4.0	0.7
Pick and place robots . . . . .	8.1	2,566	2.7	4.0	1.3	0.2	2.5	5.3	80.4	3.6	1.0
Other robots. . . . .	3.1	1,041	1.0	1.8	-	0.2	4.0	4.4	84.5	4.0	0.5
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.5	-	0.7	1.4	0.2	0.1	1.5	4.6	87.8	3.7	0.7
Automatic guided vehicle systems. . . . .	0.5	-	0.1	0.2	-	0.1	0.2	2.0	93.5	3.8	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	8.0	-	3.1	3.3	1.2	0.3	4.5	7.6	75.3	4.6	1.0
Performed on final product . . . . .	11.0	-	4.3	5.0	1.3	0.4	6.7	7.7	70.5	4.1	1.2
Communication and control:											
Local area network for technical data . . . . .	32.9	-	14.0	13.3	3.7	1.9	11.6	6.6	45.4	3.5	1.9
Local area network for factory use . . . . .	22.7	-	9.9	8.9	2.7	1.2	13.7	9.8	50.2	3.5	1.6
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	15.0	-	6.9	4.4	2.0	1.7	9.7	12.8	58.8	3.7	1.4
Programmable controllers . . . . .	25.6	13,121	7.5	11.5	4.9	1.7	4.6	5.3	61.1	3.3	1.8
Computers used for control on the factory floor . . . . .	27.5	7,234	11.4	9.6	4.4	2.0	13.1	9.1	47.9	2.5	1.9
<b>5 TO 15 YEARS</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	62.0	43,543	12.8	28.4	19.8	1.0	5.2	5.6	25.3	2.0	1.4
CAD output used to control manufacturing machines . . . . .	26.4	10,654	5.2	13.2	7.6	0.4	6.9	9.1	54.1	3.5	1.2
Digital representation of CAD output used in procurement . . . . .	12.9	-	4.8	5.3	2.3	0.5	4.5	7.4	70.4	4.8	0.9
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	13.3	-	3.8	5.2	3.8	0.6	4.5	5.7	72.9	3.7	0.8
Numerically controlled or computer numerically controlled machines . . . . .	47.9	46,258	4.2	11.9	30.5	1.3	2.5	4.1	42.9	2.7	1.4
Materials working lasers. . . . .	4.9	1,661	1.7	1.2	1.8	0.3	2.6	5.3	83.1	4.1	0.5
Pick and place robots . . . . .	8.7	8,314	2.1	3.5	2.8	0.3	4.1	4.6	78.6	3.9	0.6
Other robots. . . . .	4.2	6,410	1.0	1.7	1.4	0.1	3.4	4.1	84.2	4.1	0.4
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.5	-	0.6	0.8	1.0	0.1	1.0	3.9	89.2	3.4	0.3
Automatic guided vehicle systems. . . . .	1.0	-	0.1	0.4	0.4	0.1	0.9	1.5	93.2	3.5	0.1

See footnotes at the end of the table.

Table 4E. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY AGE OF PLANT (YEARS)—Continued

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>5 TO 15 YEARS—Cont.</b>											
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. ....	9.9	-	2.2	3.9	3.3	0.5	4.3	6.4	75.8	3.6	0.7
Performed on final product .....	13.3	-	2.8	4.5	5.6	0.4	4.6	7.2	71.2	3.7	0.8
Communication and control:											
Local area network for technical data .....	32.8	-	11.5	13.9	6.0	1.4	8.9	7.6	47.5	3.2	1.2
Local area network for factory use .....	25.0	-	9.4	8.5	5.6	1.4	10.5	10.0	51.2	3.3	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. ....	18.0	-	8.0	5.4	4.0	0.6	8.9	12.1	57.5	3.4	1.0
Programmable controllers .....	30.4	54,725	5.1	9.6	14.1	1.5	4.1	5.1	56.7	3.8	1.2
Computers used for control on the factory floor .....	28.2	24,816	8.3	10.0	8.8	1.2	10.7	9.2	48.7	3.1	1.2
<b>16 TO 30 YEARS</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) .....	64.4	47,694	11.9	29.3	22.3	0.9	4.8	4.3	24.8	1.7	1.5
CAD output used to control manufacturing machines .....	29.0	12,118	6.8	11.5	10.4	0.3	7.6	10.4	49.5	3.5	1.4
Digital representation of CAD output used in procurement. ....	12.7	-	3.4	5.7	3.3	0.4	5.5	8.1	68.6	5.1	1.0
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. ....	13.4	-	4.5	4.5	4.1	0.4	4.6	5.6	72.8	3.6	0.9
Numerically controlled or computer numerically controlled machines .....	53.7	60,953	5.4	13.1	33.6	1.6	2.9	3.7	37.4	2.3	1.5
Materials working lasers. ....	6.2	1,668	1.6	1.3	3.0	0.3	2.5	5.0	82.6	3.7	0.7
Pick and place robots .....	9.4	8,067	2.3	3.0	3.8	0.3	4.3	6.0	76.6	3.8	0.6
Other robots. ....	5.2	5,087	0.9	2.1	1.9	0.3	3.6	5.5	81.7	4.0	0.4
Automated material handling:											
Automatic storage and retrieval systems .....	2.5	-	0.5	0.8	1.0	0.1	1.0	3.1	89.8	3.5	0.2
Automatic guided vehicle systems. ....	1.4	-	0.2	0.5	0.6	0.1	0.6	1.5	92.7	3.8	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. ....	10.6	-	3.0	2.9	4.3	0.4	3.5	7.1	75.3	3.5	0.8
Performed on final product .....	13.3	-	3.4	4.0	5.2	0.7	4.5	6.7	72.0	3.5	0.9
Communication and control:											
Local area network for technical data .....	30.0	-	9.7	11.5	7.5	1.3	8.6	7.0	51.3	3.1	1.2
Local area network for factory use .....	22.6	-	7.6	8.4	6.2	0.5	10.4	8.6	54.7	3.7	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. ....	20.5	-	8.1	7.1	4.5	0.8	9.4	11.3	55.2	3.6	1.1
Programmable controllers .....	33.1	56,933	5.8	10.6	15.2	1.5	3.6	5.0	54.9	3.4	1.3
Computers used for control on the factory floor .....	29.4	36,831	6.5	11.1	10.5	1.2	8.9	9.7	48.9	3.1	1.3
<b>OVER 30 YEARS</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) .....	63.1	63,792	12.5	25.0	25.0	0.6	4.1	6.6	25.0	1.2	1.6
CAD output used to control manufacturing machines .....	31.4	12,583	6.7	11.1	13.1	0.5	6.6	9.7	49.4	2.9	1.4

See footnotes at the end of the table.



Table 4E. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY AGE OF PLANT (YEARS)**—Continued

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>OVER 30 YEARS—Cont.</b>											
Design and engineering:—Cont.											
Digital representation of CAD output used in procurement . . . . .	10.6	-	3.8	4.0	2.5	0.2	5.4	8.0	71.8	4.2	0.8
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	15.2	-	3.7	5.5	5.6	0.3	4.1	6.5	70.6	3.6	0.8
Numerically controlled or computer numerically controlled machines . . . . .	57.3	53,320	3.9	11.7	40.6	1.1	1.5	4.4	34.9	1.9	1.5
Materials working lasers. . . . .	5.7	4,000	1.6	1.7	2.3	0.2	2.6	6.0	82.6	3.0	0.4
Pick and place robots . . . . .	10.8	12,533	1.5	2.8	6.3	0.2	3.9	4.8	77.4	3.1	0.6
Other robots. . . . .	7.7	8,159	1.2	2.1	4.2	0.1	2.8	4.9	80.7	3.9	0.5
Automated material handling:											
Automatic storage and retrieval systems . . . . .	4.0	-	0.6	1.1	2.2	0.1	1.3	3.5	88.1	3.1	0.3
Automatic guided vehicle systems . . . . .	1.7	-	0.2	0.6	0.9	-	0.4	1.9	92.7	3.4	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	13.5	-	2.3	4.8	6.0	0.4	3.4	5.7	74.2	3.2	0.8
Performed on final product . . . . .	15.6	-	3.0	5.7	6.4	0.6	3.7	6.4	71.1	3.2	0.8
Communication and control:											
Local area network for technical data . . . . .	30.3	-	9.5	12.5	7.6	0.7	8.9	7.0	51.1	2.8	1.3
Local area network for factory use . . . . .	24.0	-	6.8	9.5	7.0	0.7	9.3	9.5	54.2	2.9	1.1
Intercompany computer network linking plant to subcontractors, supplies, and/or customers. . . . .	22.0	-	8.6	8.7	4.0	0.6	8.3	9.3	56.9	3.6	1.1
Programmable controllers . . . . .	39.1	88,896	4.6	13.3	19.2	1.9	4.3	5.1	48.8	2.7	1.4
Computers used for control on the factory floor . . . . .	30.7	26,679	6.0	12.1	11.1	1.5	8.2	9.0	49.3	2.8	1.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 4F. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY AGE OF PLANT (YEARS)

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
LESS THAN 5 YEARS							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	63.5	28.5	26.8	3.6	2.4	2.5	2.3
CAD output used to control manufacturing machines . . . . .	21.1	9.9	8.2	1.6	0.5	1.6	1.9
Digital representation of CAD output used in procurement. . . . .	12.5	8.1	2.8	0.2	0.9	0.5	1.3
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems. Numerically controlled or computer numerically controlled machines . . . . .	13.4	4.8	4.8	2.1	1.1	0.8	1.3
Materials working lasers. . . . .	38.4	14.5	17.6	3.6	0.9	2.1	2.2
Pick and place robots. . . . .	4.0	2.4	0.8	0.4	0.3	0.2	0.7
Other robots . . . . .	8.1	2.0	3.0	2.5	0.2	0.6	1.0
	3.1	0.7	1.1	1.1	0.1	0.3	0.5
Automated material handling:							
Automatic storage and retrieval systems . . . . .	2.5	0.4	0.9	0.4	0.7	0.1	0.7
Automatic guided vehicle systems. . . . .	0.5	-	0.2	0.2	-	0.1	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	8.0	6.4	0.4	0.1	0.2	0.9	1.0
Performed on final product . . . . .	11.0	8.0	0.6	0.9	0.7	0.9	1.2
Communication and control:							
Local area network for technical data. . .	32.9	9.0	13.9	1.9	4.3	3.9	1.9
Local area network for factory use . . . .	22.7	8.6	7.8	1.4	3.1	2.0	1.6
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	15.0	4.3	4.1	1.2	3.6	1.9	1.4
Programmable controllers . . . . .	25.6	10.9	7.2	1.8	2.8	3.1	1.8
Computers used for control on the factory floor . . . . .	27.5	11.9	8.0	1.3	3.6	2.9	1.9
5 TO 15 YEARS							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	62.0	27.2	26.8	2.9	3.5	2.0	1.4
CAD output used to control manufacturing machines . . . . .	26.4	10.9	11.2	2.4	1.1	0.9	1.2
Digital representation of CAD output used in procurement. . . . .	12.9	6.2	4.4	1.0	1.0	0.4	0.9
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems. Numerically controlled or computer numerically controlled machines . . . . .	13.3	3.9	5.4	2.2	0.9	1.1	0.8
Materials working lasers. . . . .	47.9	16.9	21.2	5.9	2.1	2.4	1.4
Pick and place robots. . . . .	4.9	2.4	0.9	0.6	0.8	0.3	0.5
Other robots . . . . .	8.7	2.1	3.6	2.2	0.3	0.6	0.6
	4.2	1.5	1.4	1.0	0.2	0.3	0.4
Automated material handling:							
Automatic storage and retrieval systems . . . . .	2.5	0.3	1.0	0.5	0.6	0.1	0.3
Automatic guided vehicle systems. . . . .	1.0	0.2	0.2	0.2	0.2	0.2	0.1
Automatic sensor-based inspection or testing:							

See footnotes at the end of the table.



Table 4F. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY AGE OF PLANT (YEARS)**—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>5 TO 15 YEARS—Cont.</b>							
Performed on incoming or in-process materials .....	9.9	8.0	0.7	0.4	0.1	0.7	0.7
Performed on final product .....	13.3	10.4	1.1	0.8	0.3	0.8	0.8
Communication and control:							
Local area network for technical data. ...	32.8	9.6	14.0	2.1	4.6	2.6	1.2
Local area network for factory use .....	25.0	6.9	10.2	1.6	4.0	2.3	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	18.0	5.0	4.2	2.1	5.5	1.3	1.0
Programmable controllers .....	30.4	11.7	10.7	2.1	3.2	2.9	1.2
Computers used for control on the factory floor .....	28.2	10.9	9.6	2.5	3.2	2.1	1.2
<b>16 TO 30 YEARS</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	64.4	27.6	27.4	3.6	3.5	2.6	1.5
CAD output used to control manufacturing machines .....	29.0	12.4	11.7	2.6	1.0	1.7	1.4
Digital representation of CAD output used in procurement.....	12.7	6.8	3.3	1.1	0.9	0.7	1.0
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	13.4	3.0	5.9	3.2	0.8	0.5	0.9
Numerically controlled or computer numerically controlled machines .....	53.7	18.8	22.8	7.6	1.7	3.8	1.5
Materials working lasers.....	6.2	2.6	1.9	0.6	1.0	0.4	0.7
Pick and place robots.....	9.4	1.4	3.6	3.5	0.4	0.5	0.6
Other robots .....	5.2	1.3	1.6	1.8	0.3	0.3	0.4
Automated material handling:							
Automatic storage and retrieval systems .....	2.5	0.3	1.1	0.6	0.5	0.1	0.2
Automatic guided vehicle systems.....	1.4	-	0.5	0.4	0.4	-	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	10.6	8.1	1.2	0.4	0.5	0.5	0.8
Performed on final product .....	13.3	9.8	1.7	0.4	0.5	1.0	0.9
Communication and control:							
Local area network for technical data. ...	30.0	9.2	13.1	1.8	3.8	2.2	1.2
Local area network for factory use .....	22.6	6.7	9.1	2.2	3.4	1.3	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	20.5	6.1	4.9	2.5	5.1	2.0	1.1
Programmable controllers .....	33.1	13.0	11.1	3.0	3.4	2.8	1.3
Computers used for control on the factory floor .....	29.4	11.5	8.7	3.6	3.4	2.3	1.3
<b>OVER 30 YEARS</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	63.1	27.3	27.0	3.9	3.1	2.1	1.6
CAD output used to control manufacturing machines .....	31.4	13.0	12.5	3.1	1.4	1.4	1.4
Digital representation of CAD output used in procurement.....	10.6	5.0	3.0	1.3	0.9	0.4	0.8
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	15.2	4.7	5.8	3.1	0.9	1.0	0.8
Numerically controlled or computer numerically controlled machines .....	57.3	21.6	23.5	7.9	1.4	3.8	1.5

See footnotes at the end of the table.

Table 4F. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY AGE OF PLANT (YEARS)**—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>OVER 30 YEARS—Cont.</b>							
Fabrication/machining and assembly:—Cont.							
Materials working lasers.....	5.7	2.9	1.3	0.7	0.6	0.5	0.4
Pick and place robots.....	10.8	1.2	3.9	4.8	0.4	0.5	0.6
Other robots.....	7.7	2.2	2.5	2.2	0.4	0.4	0.5
Automated material handling:							
Automatic storage and retrieval systems.....	4.0	0.5	1.4	1.5	0.4	0.2	0.3
Automatic guided vehicle systems.....	1.7	0.2	0.3	0.9	0.1	0.1	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials.....	13.5	10.8	1.0	0.7	0.3	0.8	0.8
Performed on final product.....	15.6	12.7	0.8	0.7	0.3	1.0	0.8
Communication and control:							
Local area network for technical data...	30.3	8.5	12.1	2.7	5.1	1.9	1.3
Local area network for factory use.....	24.0	7.0	9.5	2.0	3.9	1.7	1.1
Intercompany computer network linking plant to subcontractors, supplies, and/or customers.....	22.0	5.3	6.6	2.4	6.4	1.4	1.1
Programmable controllers.....	39.1	13.8	12.6	4.4	5.3	3.4	1.4
Computers used for control on the factory floor.....	30.7	10.7	10.3	3.1	3.9	3.2	1.2

Note: Data might not add exactly to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 4G. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MANUFACTURING PROCESS**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>FABRICATION/MACHINING</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) .....	51.5	13,152	13.1	22.9	13.9	1.5	4.5	7.8	35.0	1.1	2.2
CAD output used to control manufacturing machines .....	32.2	7,054	6.9	12.7	11.9	0.6	6.1	8.4	50.0	3.2	2.1
Digital representation of CAD output used in procurement .....	9.3	-	1.8	4.6	2.1	0.9	3.7	5.4	76.1	5.3	1.2
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems .....	8.2	-	2.0	3.4	2.3	0.5	3.0	5.2	80.0	3.6	0.8
Numerically controlled or computer numerically controlled machines .....	57.1	45,315	5.0	14.8	35.3	2.0	3.4	3.6	34.1	1.8	2.2
Materials working lasers .....	6.0	1,141	2.3	1.0	2.3	0.3	2.7	4.7	82.8	3.9	0.9
Pick and place robots .....	7.5	3,408	1.5	2.7	3.2	0.2	3.0	4.0	81.3	4.1	0.9
Other robots .....	1.9	535	0.6	0.7	0.6	0.1	2.5	4.6	86.6	4.3	0.5
Automated material handling:											
Automatic storage and retrieval systems .....	2.1	-	0.6	0.8	0.6	-	0.6	2.5	91.2	3.6	0.6
Automatic guided vehicle systems .....	0.6	-	0.1	0.2	0.2	-	0.3	1.6	94.1	3.5	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials .....	10.0	-	3.0	3.8	2.9	0.4	3.5	6.1	76.9	3.4	1.1
Performed on final product .....	13.1	-	4.6	4.5	3.7	0.3	5.2	6.7	71.3	3.6	1.3
Communication and control:											
Local area network for technical data .....	21.6	-	7.9	8.2	3.7	1.8	8.2	7.8	59.7	2.7	1.7
Local area network for factory use .....	18.2	-	6.6	6.7	3.8	1.2	9.1	10.0	59.9	2.7	1.5
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	16.3	-	6.6	5.3	3.8	0.6	7.7	12.8	59.6	3.6	1.4
Programmable controllers .....	29.5	21,976	4.2	10.7	13.1	1.5	3.4	5.7	57.9	3.5	1.9
Computers used for control on the factory floor .....	26.6	9,863	6.5	11.1	7.5	1.5	10.0	9.6	51.3	2.5	1.9
<b>ASSEMBLY</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) .....	67.3	35,930	13.8	32.6	20.3	0.5	4.4	3.6	22.7	2.0	1.6
CAD output used to control manufacturing machines .....	10.8	3,473	2.1	5.6	3.0	0.1	4.8	6.1	75.0	3.3	0.8
Digital representation of CAD output used in procurement .....	15.6	-	4.6	7.8	3.0	0.2	4.4	6.1	70.6	3.3	1.0
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems .....	15.8	-	5.4	5.8	4.0	0.5	3.8	4.3	73.3	2.7	1.0
Numerically controlled or computer numerically controlled machines .....	14.6	5,285	2.8	4.9	6.4	0.5	1.9	3.2	77.7	2.6	1.0
Materials working lasers .....	3.2	830	1.0	0.6	1.2	0.3	1.5	2.7	89.7	2.9	0.4
Pick and place robots .....	12.6	5,570	2.6	5.1	4.4	0.4	3.9	6.1	74.1	3.3	0.9
Other robots .....	4.8	7,903	0.8	1.9	1.8	0.2	2.9	4.4	84.8	3.1	0.4
Automated material handling:											
Automatic storage and retrieval systems .....	4.5	-	0.6	2.0	1.8	0.1	1.8	5.0	85.9	2.7	0.4
Automatic guided vehicle systems .....	1.8	-	0.3	0.7	0.7	-	0.9	2.3	92.3	2.7	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials .....	10.8	-	2.4	4.3	3.8	0.3	3.6	7.7	74.8	3.1	0.8
Performed on final product .....	15.7	-	3.8	5.7	5.8	0.4	4.3	6.6	70.5	2.8	1.0
Communication and control:											
Local area network for technical data .....	40.3	-	13.9	16.7	8.2	1.4	9.6	7.2	39.5	3.4	1.4
Local area network for factory use .....	31.8	-	10.9	11.5	7.9	1.5	10.3	8.3	46.6	3.0	1.3
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	20.7	-	9.7	5.9	4.5	0.6	9.9	10.6	55.4	3.5	1.1
Programmable controllers .....	25.1	33,866	6.2	8.4	9.4	1.2	3.8	4.0	64.4	2.7	1.2
Computers used for control on the factory floor .....	28.5	26,432	8.2	10.0	9.2	1.1	9.4	7.8	51.8	2.6	1.3

See footnotes at the end of the table.



Table 4G. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MANUFACTURING PROCESS—Continued

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>FABRICATION/MACHINING AND ASSEMBLY</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	69.0	122,793	13.9	29.9	24.4	0.8	5.3	5.3	18.8	1.5	1.0
CAD output used to control manufacturing machines . . . . .	33.0	26,041	8.0	14.0	10.6	0.4	8.3	10.9	45.0	2.7	0.9
Digital representation of CAD output used in procurement. . . . .	13.0	-	4.9	5.1	2.7	0.3	6.0	9.1	67.5	4.4	0.7
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	15.9	-	4.9	5.7	5.0	0.3	5.2	7.2	68.3	3.5	0.6
Numerically controlled or computer numerically controlled machines . . . . .	62.7	119,511	5.5	15.3	40.4	1.5	2.7	4.4	28.4	1.8	1.0
Materials working lasers. . . . .	6.1	5,654	1.7	1.7	2.4	0.2	2.7	6.5	81.3	3.3	0.4
Pick and place robots . . . . .	9.7	21,977	2.2	3.2	4.1	0.3	4.3	5.6	77.4	3.0	0.4
Other robots. . . . .	6.6	12,045	1.2	2.5	2.7	0.2	3.8	5.3	80.7	3.6	0.3
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.8	-	0.6	0.8	1.3	0.1	1.0	3.7	89.4	3.0	0.2
Automatic guided vehicle systems . . . . .	1.3	-	0.2	0.4	0.6	0.1	.6	1.5	93.4	3.2	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	11.1	-	2.6	3.6	4.5	0.4	4.1	7.0	74.5	3.3	0.5
Performed on final product . . . . .	13.5	-	2.8	4.5	5.5	0.6	4.9	7.5	70.9	3.3	0.6
Communication and control:											
Local area network for technical data . . . . .	33.3	-	11.4	13.7	7.1	1.1	9.8	7.3	47.0	2.7	0.9
Local area network for factory use . . . . .	24.4	-	8.4	9.3	5.9	0.8	11.3	10.2	51.1	3.0	0.8
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	20.5	-	8.5	7.2	3.9	1.0	9.5	11.5	55.5	3.0	0.8
Programmable controllers . . . . .	36.0	152,362	5.5	12.0	16.6	2.0	4.6	5.6	50.8	3.0	0.9
Computers used for control on the factory floor . . . . .	30.8	57,031	8.0	11.4	10.1	1.3	10.6	9.8	46.0	2.8	0.9
<b>NEITHER FABRICATION/MACHINING NOR ASSEMBLY</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	29.3	5,354	6.2	13.0	8.4	1.6	3.4	3.3	58.7	5.4	2.9
CAD output used to control manufacturing machines . . . . .	8.2	1,325	1.1	2.3	4.4	0.4	2.7	6.0	75.4	7.6	1.5
Digital representation of CAD output used in procurement. . . . .	4.3	-	1.9	1.2	1.0	0.2	2.1	4.4	80.2	9.0	1.2
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	4.9	-	0.9	1.4	1.8	0.8	1.4	1.6	84.0	8.1	1.3
Numerically controlled or computer numerically controlled machines . . . . .	12.8	1,367	2.3	1.9	8.5	0.1	0.7	3.1	75.5	8.0	2.3
Materials working lasers. . . . .	2.9	217	0.4	0.7	1.8	-	0.9	1.4	86.6	8.2	1.1
Pick and place robots . . . . .	2.3	498	0.9	0.8	0.5	-	2.6	1.7	85.5	8.0	0.5
Other robots. . . . .	1.8	217	0.9	0.5	0.4	-	2.3	1.4	86.3	8.2	0.6
Automated material handling:											
Automatic storage and retrieval systems . . . . .	1.1	-	0.3	0.3	0.3	0.2	1.4	2.6	87.6	7.3	0.3
Automatic guided vehicle systems . . . . .	0.6	-	0.2	0.2	0.3	-	0.4	1.7	89.1	8.2	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	9.3	-	1.5	4.0	2.7	1.0	3.3	3.0	78.3	6.1	1.8
Performed on final product . . . . .	10.5	-	1.7	3.6	4.2	1.0	2.2	3.3	77.0	7.0	1.9
Communication and control:											
Local area network for technical data . . . . .	19.4	-	5.8	7.0	5.3	1.3	4.7	3.5	65.3	7.1	2.3
Local area network for factory use . . . . .	14.3	-	5.9	2.7	4.9	0.7	8.5	4.7	64.7	7.9	2.0

See footnotes at the end of the table.

Table 4G. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MANUFACTURING PROCESS—Continued**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>NEITHER FABRICATION/MACHINING NOR ASSEMBLY—Cont.</b>											
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers.....	12.3	-	4.8	3.8	3.0	0.7	6.2	7.8	66.1	7.6	1.9
Programmable controllers .....	29.8	5,926	6.4	10.1	12.1	1.1	1.3	2.2	59.2	7.5	3.0
Computers used for control on the factory floor .....	20.9	2,506	5.9	5.8	7.4	1.9	4.9	7.8	59.8	6.6	2.4

Note: Data might not add exactly to totals due to the independent rounding of individual figures.

- Represents zero

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 4H. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MANUFACTURING PROCESS

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>FABRICATION/MACHINING</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	51.5	26.0	17.9	3.8	1.9	2.0	2.2
CAD output used to control manufacturing machines . . . . .	32.2	14.3	14.1	1.4	0.9	2.0	2.1
Digital representation of CAD output used in procurement . . . . .	9.3	5.0	2.7	0.8	0.4	0.5	1.2
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems . .	8.2	1.8	3.4	2.2	0.3	0.6	0.8
Numerically controlled or computer numerically controlled machines . . . . .	57.1	20.9	25.2	6.2	0.9	4.5	2.2
Materials working lasers . . . . .	6.0	2.6	1.1	0.9	1.0	0.7	0.9
Pick and place robots . . . . .	7.5	1.5	3.2	2.3	-	0.5	0.9
Other robots . . . . .	1.9	0.2	0.9	0.5	0.1	0.2	0.5
Automated material handling:							
Automatic storage and retrieval systems . .	2.1	0.3	0.9	0.4	0.5	0.1	0.6
Automatic guided vehicle systems . . . . .	0.6	-	0.2	0.3	0.1	-	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	10.0	7.7	0.9	0.3	0.5	0.6	1.1
Performed on final product . . . . .	13.1	10.5	1.1	0.3	0.2	0.9	1.3
Communication and control:							
Local area network for technical data . . . .	21.6	6.8	7.9	1.3	2.7	2.9	1.7
Local area network for factory use . . . . .	18.2	6.3	6.4	0.9	2.6	2.0	1.5
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	16.3	5.2	3.9	1.3	4.8	1.2	1.4
Programmable controllers . . . . .	29.5	13.4	8.8	1.9	2.5	3.7	1.9
Computers used for control on the factory floor . . . . .	26.6	9.8	8.4	2.1	3.4	3.3	1.9
<b>ASSEMBLY</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	67.3	29.3	29.9	3.6	3.1	1.7	1.6
CAD output used to control manufacturing machines . . . . .	10.8	5.6	3.2	1.4	0.4	0.3	0.8
Digital representation of CAD output used in procurement . . . . .	15.6	9.9	3.5	0.8	1.1	0.3	1.0
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems . .	15.8	5.7	5.1	2.9	1.3	1.1	1.0
Numerically controlled or computer numerically controlled machines . . . . .	14.6	5.6	5.0	2.8	0.6	0.8	1.0
Materials working lasers . . . . .	3.2	1.9	0.3	0.4	0.4	0.2	0.4
Pick and place robots . . . . .	12.6	3.5	4.6	3.3	0.5	0.8	0.9
Other robots . . . . .	4.8	1.8	1.2	1.4	0.2	0.2	0.4
Automated material handling:							
Automatic storage and retrieval systems . .	4.5	0.7	1.9	1.1	0.7	0.2	0.4
Automatic guided vehicle systems . . . . .	1.8	0.3	0.4	0.7	0.2	0.1	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	10.8	8.3	1.0	0.7	-	0.8	0.8

See footnotes at the end of the table.



Table 4H. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MANUFACTURING PROCESS—Continued**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>ASSEMBLY—Cont.</b>							
Performed on final product. ....	15.7	12.2	1.2	1.4	0.2	0.9	1.0
Communication and control:							
Local area network for technical data ....	40.3	12.2	17.4	2.6	4.9	3.4	1.4
Local area network for factory use. ....	31.8	11.4	11.5	2.5	3.6	2.9	1.3
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. ....	20.7	6.5	5.5	2.5	5.0	1.3	1.1
Programmable controllers. ....	25.1	10.1	7.2	2.3	3.4	2.3	1.2
Computers used for control on the factory floor. ....	28.5	12.6	8.3	2.5	3.0	2.4	1.3
<b>FABRICATION/MACHINING AND ASSEMBLY</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE). ....	69.0	28.7	31.0	3.6	3.7	2.4	1.0
CAD output used to control manufacturing machines. ....	33.0	13.4	13.6	3.3	1.4	1.5	0.9
Digital representation of CAD output used in procurement. ....	13.0	6.1	4.0	1.2	1.1	0.5	0.7
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems ..	15.9	4.4	6.7	2.9	1.1	0.8	0.6
Numerically controlled or computer numerically controlled machines. ....	62.7	22.3	27.1	8.3	2.4	3.4	1.0
Materials working lasers. ....	6.1	2.8	1.5	0.7	0.8	0.3	0.4
Pick and place robots. ....	9.7	1.4	3.7	3.8	0.4	0.5	0.4
Other robots. ....	6.6	1.8	2.2	2.0	0.3	0.4	0.3
Automated material handling:							
Automatic storage and retrieval systems. .	2.8	0.3	1.0	0.8	0.5	0.1	0.2
Automatic guided vehicle systems. ....	1.3	0.1	0.4	0.5	0.2	0.1	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials. ....	11.1	8.9	0.9	0.5	0.3	0.6	0.5
Performed on final product. ....	13.5	10.3	1.2	0.6	0.6	0.9	0.6
Communication and control:							
Local area network for technical data ....	33.3	9.3	14.5	2.4	5.1	2.1	0.9
Local area network for factory use. ....	24.4	6.2	10.3	2.2	4.2	1.6	0.8
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. ....	20.5	5.2	5.5	2.2	5.9	1.8	0.8
Programmable controllers. ....	36.0	12.8	12.8	3.4	4.1	3.2	0.9
Computers used for control on the factory floor. ....	30.8	11.1	10.4	3.3	3.8	2.3	0.9
<b>NEITHER FABRICATION/MACHINING NOR ASSEMBLY</b>							
Design and engineering:							
Computer aided design (CAD) or computer-aided engineering (CAE). ....	29.3	14.6	7.9	0.9	3.8	2.2	2.9
CAD output used to control manufacturing machines. ....	8.2	4.0	2.8	0.8	0.1	0.4	1.5
Digital representation of CAD output used in procurement. ....	4.3	2.9	1.1	0.2	0.1	-	1.2

See footnotes at the end of the table.

Table 4H. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MANUFACTURING PROCESS—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>NEITHER FABRICATION/MACHINING NOR ASSEMBLY—Cont.</b>							
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems . .	4.9	0.8	1.9	1.3	0.1	0.9	1.3
Numerically controlled or computer numerically controlled machines . . . . .	12.8	3.5	5.6	1.6	0.2	1.9	2.3
Materials working lasers . . . . .	2.9	1.3	1.3	-	-	0.3	1.1
Pick and place robots . . . . .	2.3	0.4	1.0	0.5	-	0.3	0.5
Other robots . . . . .	1.8	1.1	0.2	0.2	-	0.4	0.6
Automated material handling:							
Automatic storage and retrieval systems . .	1.1	0.3	0.4	0.3	-	-	0.3
Automatic guided vehicle systems . . . . .	0.6	-	0.2	0.2	0.2	-	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	9.3	6.8	0.7	-	0.7	1.2	1.8
Performed on final product . . . . .	10.5	7.7	0.9	0.1	0.3	1.6	1.9
Communication and control:							
Local area network for technical data . . . .	19.4	6.6	6.6	1.3	2.7	2.3	2.3
Local area network for factory use . . . . .	14.3	6.5	4.2	0.3	2.3	0.9	2.0
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	12.3	2.8	2.0	2.9	2.9	1.7	1.9
Programmable controllers . . . . .	29.8	12.8	7.4	2.4	4.4	3.0	3.0
Computers used for control on the factory floor . . . . .	20.9	11.4	4.3	0.7	1.6	2.9	2.4

Note: Data might not add exactly to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 4I. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>CONSUMER</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	48.2	9,297	12.6	24.1	10.5	1.1	4.8	7.0	35.8	4.2	2.2
CAD output used to control manufacturing machines . . . . .	15.1	2,446	3.6	6.5	4.7	0.3	5.9	10.0	64.0	5.1	1.4
Digital representation of CAD output used in procurement . . . . .	8.4	-	2.7	2.6	2.8	0.3	4.5	6.2	75.0	5.9	1.2
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	12.6	-	2.8	5.1	4.3	0.4	4.2	7.7	70.5	5.0	1.0
Numerically controlled or computer numerically controlled machines . . . . .	33.9	8,994	5.3	11.2	17.0	0.4	2.6	6.0	52.8	4.7	2.0
Materials working lasers. . . . .	3.8	674	0.8	1.7	1.3	-	1.9	5.1	83.3	5.9	0.7
Pick and place robots . . . . .	12.8	5,968	2.2	4.6	5.6	0.4	6.4	6.7	69.0	5.1	0.9
Other robots. . . . .	7.2	5,397	1.1	2.4	3.6	0.2	3.4	5.5	78.1	5.8	0.7
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.7	-	0.4	1.0	1.1	0.2	1.4	6.4	84.6	5.0	0.3
Automatic guided vehicle systems . . . . .	2.1	-	0.4	0.7	1.0	-	1.5	2.5	88.8	5.0	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	9.7	-	2.2	3.7	3.4	0.4	4.2	6.9	73.6	5.5	0.8
Performed on final product . . . . .	12.6	-	3.3	3.5	5.1	0.6	4.6	7.0	70.7	5.2	1.0
Communication and control:											
Local area network for technical data . . . . .	20.7	-	7.9	7.7	4.1	0.9	11.1	7.8	55.0	5.3	1.4
Local area network for factory use . . . . .	20.9	-	8.3	6.8	4.4	1.4	11.2	8.8	54.0	5.0	1.5
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	20.6	-	8.6	6.1	4.9	1.0	9.8	10.0	54.3	5.3	1.6
Programmable controllers . . . . .	35.3	45,574	4.0	15.6	13.6	2.1	3.6	7.2	49.0	4.9	1.9
Computers used for control on the factory floor . . . . .	25.2	9,833	7.0	10.1	7.0	1.1	10.8	10.1	49.1	4.8	1.6
<b>COMMERCIAL</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	66.3	23,786	13.4	30.8	21.3	0.8	2.8	4.9	24.7	1.4	2.0
CAD output used to control manufacturing machines . . . . .	26.7	4,872	6.9	12.8	6.9	0.2	7.1	8.0	56.3	1.9	1.8
Digital representation of CAD output used in procurement . . . . .	16.7	-	5.6	8.2	2.5	0.4	4.3	8.5	67.4	3.1	1.4
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	17.1	-	5.8	6.7	4.4	0.2	5.5	5.5	69.1	2.7	1.3
Numerically controlled or computer numerically controlled machines . . . . .	44.4	19,651	4.3	11.9	27.3	0.9	1.9	4.6	47.4	1.7	2.0
Materials working lasers. . . . .	6.1	3,195	2.7	1.0	2.2	0.1	3.3	5.0	83.2	2.5	1.0
Pick and place robots . . . . .	10.6	6,259	2.2	4.5	3.7	0.2	4.4	5.7	77.1	2.2	0.9
Other robots. . . . .	4.0	1,221	0.9	1.3	1.6	0.2	5.5	5.0	82.6	2.9	0.4
Automated material handling:											
Automatic storage and retrieval systems . . . . .	3.0	-	0.8	1.1	1.0	0.1	1.8	4.1	88.7	2.3	0.3
Automatic guided vehicle systems. . . . .	1.3	-	0.3	0.5	0.4	0.1	0.6	1.8	93.8	2.4	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	10.2	-	3.0	3.8	3.0	0.5	4.7	7.8	74.4	2.9	1.0
Performed on final product . . . . .	11.6	-	3.2	3.3	4.6	0.5	4.2	8.7	72.8	2.6	1.1

See footnotes at the end of the table.



Table 4I. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS—Continued

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>COMMERCIAL—Cont.</b>											
Communication and control:											
Local area network for technical data . . . . .	38.7	-	15.1	15.5	6.8	1.3	9.0	7.6	42.5	2.2	1.8
Local area network for factory use . . . . .	27.4	-	11.2	9.5	5.6	1.2	12.9	9.7	47.8	2.2	1.6
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	18.7	-	9.4	6.1	2.5	0.6	10.8	12.2	55.2	3.1	1.5
Programmable controllers . . . . .	30.2	19,686	6.2	9.5	13.5	1.1	5.2	4.5	56.5	3.6	1.7
Computers used for control on the factory floor . . . . .	32.2	13,338	11.7	11.7	7.4	1.3	10.4	9.1	46.8	1.6	1.8
<b>INDUSTRIAL</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	64.3	78,851	12.6	28.4	22.4	1.0	5.4	5.0	23.8	1.5	1.2
CAD output used to control manufacturing machines . . . . .	29.8	16,907	6.3	12.7	10.4	0.5	7.0	8.7	51.4	3.2	1.1
Digital representation of CAD output used in procurement. . . . .	11.3	-	3.8	4.6	2.3	0.5	4.9	7.0	72.2	4.7	0.8
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	11.7	-	3.4	4.1	3.7	0.5	3.9	5.9	74.6	3.9	0.7
Numerically controlled or computer numerically controlled machines . . . . .	55.6	90,324	4.4	12.8	36.9	1.5	2.8	3.2	36.4	2.0	1.2
Materials working lasers. . . . .	5.3	2,357	1.5	1.1	2.4	0.4	1.8	5.3	84.2	3.3	0.5
Pick and place robots . . . . .	7.7	9,446	2.2	2.5	2.8	0.2	2.5	4.7	81.7	3.4	0.5
Other robots. . . . .	3.5	6,097	0.8	1.4	1.2	0.2	2.5	4.2	86.0	3.7	0.3
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.4	-	0.6	0.9	0.8	0.1	0.9	3.0	90.3	3.3	0.3
Automatic guided vehicle systems. . . . .	0.7	-	0.1	0.2	0.2	0.1	0.3	1.3	94.4	3.3	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	8.9	-	2.3	2.9	3.4	0.3	3.1	6.3	78.2	3.4	0.6
Performed on final product . . . . .	12.2	-	3.0	4.6	4.2	0.4	3.8	6.9	73.9	3.3	0.7
Communication and control:											
Local area network for technical data . . . . .	30.3	-	9.9	12.4	6.7	1.3	8.9	6.7	51.1	3.0	1.0
Local area network for factory use . . . . .	21.7	-	7.0	8.3	5.6	0.8	10.1	9.2	55.8	3.2	0.9
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	18.2	-	7.8	6.0	3.5	0.9	9.0	10.9	58.7	3.3	0.9
Programmable controllers . . . . .	32.2	67,601	5.6	10.8	14.4	1.5	4.0	5.0	55.9	2.8	1.1
Computers used for control on the factory floor . . . . .	27.4	31,559	5.9	10.4	9.9	1.2	9.5	9.4	50.9	2.9	1.0
<b>TRANSPORTATION</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	64.3	22,060	15.6	26.4	21.0	1.2	6.2	5.8	22.9	0.8	2.3
CAD output used to control manufacturing machines . . . . .	31.3	5,511	7.4	10.7	12.2	0.9	8.3	11.5	46.3	2.5	2.0
Digital representation of CAD output used in procurement. . . . .	11.9	-	3.8	5.1	2.7	0.2	6.3	9.1	67.6	5.1	1.4
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	20.7	-	6.4	7.1	7.0	0.2	5.1	7.0	63.8	3.4	1.6
Numerically controlled or computer numerically controlled machines . . . . .	54.9	25,838	4.7	16.4	31.8	1.9	2.4	5.6	35.2	1.9	2.2
Materials working lasers. . . . .	5.6	588	2.1	1.9	1.4	0.2	3.6	5.4	82.0	3.4	0.6
Pick and place robots . . . . .	14.8	6,877	2.9	4.6	6.7	0.5	6.4	5.5	69.9	3.4	1.1
Other robots. . . . .	13.6	6,648	2.8	5.3	5.2	0.2	4.5	6.7	71.0	4.3	1.1

See footnotes at the end of the table.

Table 4I. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS—Continued**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" <sup>1</sup> (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
TRANSPORTATION—Cont.											
Automated material handling:											
Automatic storage and retrieval systems . . . . .	3.5	-	0.9	1.0	1.5	0.2	0.7	4.7	87.8	3.3	0.4
Automatic guided vehicle systems . . . . .	2.9	-	0.6	0.8	1.3	0.1	0.8	3.0	90.1	3.1	0.4
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	17.8	-	3.2	7.4	6.5	0.6	4.0	7.6	67.8	2.7	1.3
Performed on final product . . . . .	21.1	-	3.9	7.2	9.1	0.9	7.8	6.4	61.9	2.8	1.4
Communication and control:											
Local area network for technical data . . . . .	33.9	-	11.3	13.1	8.3	1.2	9.4	8.5	45.2	2.9	1.9
Local area network for factory use . . . . .	29.2	-	9.3	11.0	8.3	0.6	12.3	9.7	46.1	2.6	1.8
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	32.2	-	10.4	12.9	8.1	0.8	6.8	12.3	46.2	2.5	1.9
Programmable controllers . . . . .	44.3	56,854	7.8	13.9	20.2	2.4	3.6	3.7	45.3	3.1	2.1
Computers used for control on the factory floor . . . . .	34.2	24,134	10.7	12.3	10.3	0.9	11.4	9.6	42.1	2.7	1.9
GOVERNMENT											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	74.1	26,612	13.8	30.9	28.6	0.8	1.4	4.8	18.3	1.5	2.9
CAD output used to control manufacturing machines . . . . .	33.8	3,832	7.3	13.4	12.6	0.5	7.1	11.8	43.7	3.6	2.9
Digital representation of CAD output used in procurement. . . . .	19.1	-	7.9	7.5	3.6	0.1	5.6	7.5	62.7	5.1	2.1
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	16.3	-	3.8	6.2	6.2	0.1	4.1	6.2	69.7	3.7	2.1
Numerically controlled or computer numerically controlled machines . . . . .	62.9	11,620	7.2	13.2	41.4	1.0	1.5	3.4	31.1	1.1	2.8
Materials working lasers. . . . .	7.0	452	0.8	2.1	3.9	0.1	4.1	6.2	78.7	3.9	0.8
Pick and place robots . . . . .	9.8	633	2.0	3.5	4.3	-	4.9	5.9	75.5	3.9	1.1
Other robots. . . . .	4.9	313	0.9	1.6	2.3	0.1	3.2	5.5	82.3	4.1	0.5
Automated material handling:											
Automatic storage and retrieval systems . . . . .	6.3	-	0.7	1.7	3.9	-	1.0	2.8	86.3	3.6	0.6
Automatic guided vehicle systems . . . . .	0.9	-	-	0.2	0.7	-	0.5	1.4	93.2	4.0	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	16.0	-	3.7	4.7	7.5	0.2	6.2	6.7	67.8	3.4	1.8
Performed on final product . . . . .	18.4	-	2.9	7.1	7.8	0.6	5.7	7.2	63.1	5.7	1.7
Communication and control:											
Local area network for technical data . . . . .	45.3	-	13.0	18.7	11.9	1.7	7.9	5.7	39.7	1.4	3.0
Local area network for factory use . . . . .	30.7	-	8.5	13.3	8.0	1.0	7.2	10.4	48.6	3.1	2.5
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	15.7	-	5.9	5.3	3.8	0.6	7.8	14.2	58.6	3.9	1.6
Programmable controllers . . . . .	29.3	7,121	4.7	8.8	14.3	1.4	4.2	5.4	57.4	3.7	2.3
Computers used for control on the factory floor . . . . .	33.6	7,312	7.2	10.2	15.1	1.0	9.4	10.4	43.0	3.5	2.7
OTHER											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	63.7	14,230	14.8	29.0	19.3	0.5	5.8	4.8	23.3	2.4	2.4
CAD output used to control manufacturing machines . . . . .	26.1	3,975	7.6	12.0	6.4	0.2	6.7	9.7	53.9	3.6	2.1
Digital representation of CAD output used in procurement. . . . .	11.7	-	3.4	5.8	2.1	0.3	6.4	8.6	68.2	5.2	1.2

See footnotes at the end of the table.

Table 4I. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS—Continued**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within			Not specified	
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use		
<b>OTHER—Cont.</b>											
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	11.2	-	5.1	3.4	1.9	0.8	5.1	4.2	75.4	4.1	1.2
Numerically controlled or computer numerically controlled machines . . . . .	42.2	12,811	4.5	11.7	25.2	0.8	3.2	3.6	47.9	3.0	2.4
Materials working lasers. . . . .	4.9	378	1.7	1.7	1.3	0.2	2.5	4.6	83.3	4.8	0.7
Pick and place robots . . . . .	5.7	2,174	0.9	1.9	2.8	0.1	3.9	4.3	81.2	4.9	0.7
Other robots. . . . .	4.0	660	0.5	1.8	1.7	-	3.2	4.1	84.6	4.1	0.5
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.4	-	0.2	0.8	1.4	-	1.3	2.3	89.5	4.5	0.4
Automatic guided vehicle systems . . . . .	0.8	-	-	0.5	0.4	-	0.7	1.0	92.7	4.8	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	10.0	-	2.0	3.4	4.2	0.5	4.6	5.7	75.9	3.8	1.2
Performed on final product . . . . .	12.7	-	2.8	4.0	5.2	0.8	5.8	5.2	72.3	4.0	1.4
Communication and control:											
Local area network for technical data . . . . .	27.8	-	9.2	13.4	4.1	1.1	8.6	7.3	52.2	4.1	1.9
Local area network for factory use . . . . .	22.3	-	8.6	7.7	5.1	0.9	9.0	10.3	54.1	4.2	1.7
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	13.6	-	5.4	4.9	2.6	0.7	8.6	11.4	63.0	3.4	1.5
Programmable controllers . . . . .	24.1	14,467	3.5	8.1	11.1	1.5	3.3	5.4	63.8	3.4	1.7
Computers used for control on the factory floor . . . . .	26.9	8,242	6.7	10.8	7.7	1.7	8.2	8.2	53.8	2.9	1.9

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 4J. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>CONSUMER</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	48.2	21.3	18.5	3.7	2.9	2.0	2.2
CAD output used to control manufacturing machines . . . . .	15.1	7.0	4.5	2.2	0.8	0.7	1.4
Digital representation of CAD output used in procurement. . . . .	8.4	3.3	2.8	1.0	0.9	0.5	1.2
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	12.6	3.0	4.0	3.5	1.4	1.1	1.0
Numerically controlled or computer numerically controlled machines . . . . .	33.9	13.8	11.6	5.1	1.7	2.1	2.0
Materials working lasers. . . . .	3.8	1.9	0.7	0.3	0.8	0.1	0.7
Pick and place robots. . . . .	12.8	2.0	3.1	6.5	0.5	0.9	0.9
Other robots. . . . .	7.2	2.2	1.5	3.0	0.2	0.4	0.7
Automated material handling:							
Automatic storage and retrieval systems. . . . .	2.7	0.5	0.8	0.8	0.3	0.2	0.3
Automatic guided vehicle systems. . . . .	2.1	0.1	0.6	1.0	0.3	-	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	9.7	7.7	0.8	0.6	0.1	0.8	0.8
Performed on final product . . . . .	12.6	9.8	0.8	0.8	0.1	1.1	1.0
Communication and control:							
Local area network for technical data. . .	20.7	6.8	8.1	0.9	3.2	1.8	1.4
Local area network for factory use . . . .	20.9	5.9	7.0	1.1	4.2	2.8	1.5
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	20.6	5.5	4.8	2.6	5.9	1.8	1.6
Programmable controllers . . . . .	35.3	13.3	10.0	3.8	5.2	3.0	1.9
Computers used for control on the factory floor . . . . .	25.2	11.1	6.8	2.4	3.4	1.7	1.6
<b>COMMERCIAL</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	66.3	29.4	28.9	2.6	3.5	2.1	2.0
CAD output used to control manufacturing machines . . . . .	26.7	12.8	9.6	2.1	1.2	1.1	1.8
Digital representation of CAD output used in procurement. . . . .	16.7	10.8	4.3	0.6	0.8	0.3	1.4
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	17.1	5.9	7.5	1.9	1.1	1.0	1.3
Numerically controlled or computer numerically controlled machines . . . . .	44.4	18.0	17.3	5.8	1.9	1.8	2.0
Materials working lasers. . . . .	6.1	2.3	1.9	0.8	0.8	0.3	1.0
Pick and place robots. . . . .	10.6	2.2	4.6	3.0	0.5	0.5	0.9
Other robots. . . . .	4.0	1.0	1.1	1.6	-	0.3	0.4
Automated material handling:							
Automatic storage and retrieval systems. . . . .	3.0	0.5	1.3	0.7	0.4	0.2	0.3
Automatic guided vehicle systems. . . . .	1.3	0.1	0.5	0.4	0.2	0.2	0.2

See footnotes at the end of the table.

Table 4J. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>COMMERCIAL—Cont.</b>							
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	10.2	7.7	1.0	0.5	0.1	0.8	1.0
Performed on final product .....	11.6	8.7	1.0	0.4	0.3	1.2	1.1
Communication and control:							
Local area network for technical data. . .	38.7	12.2	15.0	2.8	6.0	2.8	1.8
Local area network for factory use .....	27.4	9.0	10.7	2.4	3.8	1.7	1.6
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	18.7	5.3	5.8	2.2	4.4	1.0	1.5
Programmable controllers .....	30.2	11.5	10.4	3.6	2.9	1.9	1.7
Computers used for control on the factory floor .....	32.2	14.3	9.2	3.7	2.6	2.6	1.8
<b>INDUSTRIAL</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	64.3	26.6	29.9	3.1	3.1	2.0	1.2
CAD output used to control manufacturing machines .....	29.8	12.5	12.7	2.3	1.0	1.6	1.1
Digital representation of CAD output used in procurement. ....	11.3	5.4	3.8	0.8	0.8	0.5	0.8
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems. ....	11.7	3.1	5.2	2.3	0.7	0.5	0.7
Numerically controlled or computer numerically controlled machines .....	55.6	18.6	26.1	7.0	1.5	2.9	1.2
Materials working lasers. ....	5.3	2.6	1.3	0.5	0.7	0.5	0.5
Pick and place robots. ....	7.7	1.3	3.4	2.2	0.2	0.5	0.5
Other robots .....	3.5	0.8	1.6	0.8	0.1	0.2	0.3
Automated material handling:							
Automatic storage and retrieval systems .....	2.4	0.3	1.0	0.4	0.5	0.1	0.3
Automatic guided vehicle systems. ....	0.7	0.1	0.2	0.2	0.1	0.1	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	8.9	7.4	0.7	0.3	0.3	0.3	0.6
Performed on final product .....	12.2	9.6	1.0	0.6	0.5	0.5	0.7
Communication and control:							
Local area network for technical data. . .	30.3	8.5	13.8	1.7	4.0	2.4	1.0
Local area network for factory use .....	21.7	6.2	9.2	1.5	3.6	1.3	0.9
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	18.2	4.9	4.5	2.3	5.0	1.6	0.9
Programmable controllers .....	32.2	12.3	11.6	2.5	3.3	2.8	1.1
Computers used for control on the factory floor .....	27.4	9.7	9.4	2.9	3.5	2.2	1.0
<b>TRANSPORTATION</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	64.3	28.6	24.5	4.2	4.2	3.0	2.3
CAD output used to control manufacturing machines .....	31.3	11.0	14.3	3.0	1.0	2.2	2.0
Digital representation of CAD output used in procurement. ....	11.9	6.3	3.1	0.7	1.4	0.5	1.4

See footnotes at the end of the table.

Table 4J. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS—Continued**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>TRANSPORTATION—Cont.</b>							
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	20.7	6.4	8.4	4.1	1.2	0.9	1.6
Numerically controlled or computer numerically controlled machines .....	54.9	21.0	21.3	5.7	2.3	6.0	2.2
Materials working lasers.....	5.6	2.4	1.3	1.0	0.8	0.3	0.6
Pick and place robots.....	14.8	2.3	5.5	6.0	0.3	0.8	1.1
Other robots.....	13.6	4.8	3.6	3.4	1.1	0.8	1.1
Automated material handling:							
Automatic storage and retrieval systems.....	3.5	0.2	0.8	1.5	0.8	0.2	0.4
Automatic guided vehicle systems.....	2.9	0.3	0.7	1.2	0.6	0.1	0.4
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	17.8	14.5	1.5	0.5	0.4	1.0	1.3
Performed on final product .....	21.1	17.2	1.4	0.6	0.6	1.4	1.4
Communication and control:							
Local area network for technical data...	33.9	8.2	13.6	3.0	6.6	2.6	1.9
Local area network for factory use .....	29.2	8.2	11.4	2.8	4.9	2.3	1.8
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	32.2	8.6	7.7	2.4	10.7	2.9	1.9
Programmable controllers .....	44.3	15.7	14.3	2.7	7.2	4.8	2.1
Computers used for control on the factory floor .....	34.2	12.6	11.3	2.3	5.5	2.6	1.9
<b>GOVERNMENT</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	74.1	36.8	26.0	7.4	2.3	1.9	2.9
CAD output used to control manufacturing machines .....	33.8	13.5	10.7	7.8	1.2	0.8	2.9
Digital representation of CAD output used in procurement.....	19.1	10.1	2.9	4.5	1.2	0.4	2.1
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	16.3	5.3	4.5	5.6	0.7	0.2	2.1
Numerically controlled or computer numerically controlled machines .....	62.9	19.7	26.7	13.1	1.4	2.9	2.8
Materials working lasers.....	7.0	4.6	0.8	0.7	0.7	0.1	0.8
Pick and place robots.....	9.8	2.3	3.4	3.3	0.5	0.2	1.1
Other robots.....	4.9	2.4	0.7	1.4	0.3	0.2	0.5
Automated material handling:							
Automatic storage and retrieval systems.....	6.3	0.7	3.0	1.7	0.7	0.2	0.6
Automatic guided vehicle systems.....	0.9	-	0.3	0.5	-	-	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	16.0	12.1	1.4	0.9	0.5	1.1	1.8
Performed on final product .....	18.4	12.5	1.9	2.8	0.6	0.7	1.7
Communication and control:							
Local area network for technical data...	45.3	13.5	19.2	5.4	4.8	2.6	3.0
Local area network for factory use .....	30.7	10.3	11.9	3.6	2.8	2.3	2.5

See footnotes at the end of the table.



Table 4J. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET FOR MOST PRODUCTS—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>GOVERNMENT—Cont.</b>							
Communication and control:—Cont.							
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	15.7	5.1	4.7	1.7	3.0	1.3	1.6
Programmable controllers .....	29.3	12.3	7.6	5.1	2.2	2.1	2.3
Computers used for control on the factory floor .....	33.6	13.3	12.4	3.6	1.4	2.9	2.7
<b>OTHER</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	63.7	30.5	23.1	3.2	4.7	2.7	2.4
CAD output used to control manufacturing machines .....	26.1	11.0	12.2	1.2	1.4	0.5	2.1
Digital representation of CAD output used in procurement. ....	11.7	6.1	2.7	1.1	1.4	0.3	1.2
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	11.2	3.3	4.0	2.1	0.9	0.9	1.2
Numerically controlled or computer numerically controlled machines .....	42.2	16.6	17.3	4.3	1.9	2.5	2.4
Materials working lasers.....	4.9	2.6	0.8	0.7	0.5	0.3	0.7
Pick and place robots.....	5.7	1.5	2.0	1.7	0.3	0.2	0.7
Other robots .....	4.0	1.1	1.5	1.1	0.2	0.1	0.5
Automated material handling:							
Automatic storage and retrieval systems .....	2.4	0.1	0.8	0.9	0.6	0.1	0.4
Automatic guided vehicle systems.....	0.8	0.1	0.1	0.4	0.3	0.1	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	10.0	7.0	0.9	0.4	1.1	0.7	1.2
Performed on final product .....	12.7	9.7	1.3	0.4	0.3	1.0	1.4
Communication and control:							
Local area network for technical data...	27.8	9.1	10.8	2.0	4.1	2.0	1.9
Local area network for factory use ....	22.3	6.7	8.3	2.1	3.3	1.8	1.7
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	13.6	4.3	3.0	1.2	4.2	0.9	1.5
Programmable controllers .....	24.1	10.2	6.7	1.5	2.9	3.4	1.7
Computers used for control on the factory floor .....	26.9	10.7	7.7	1.8	4.2	2.8	1.9

Note: Data might not add exactly to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 4K. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within				
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use	Not specified	
<b>LESS THAN \$5</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	46.3	18,568	12.9	20.3	12.9	0.2	7.4	6.9	36.7	2.8	2.0
CAD output used to control manufacturing machines . . . . .	19.1	3,330	5.2	6.9	6.9	0.2	5.7	9.9	62.2	3.1	1.6
Digital representation of CAD output used in procurement . . . . .	7.6	-	1.6	4.0	1.8	0.3	4.3	7.5	75.2	5.3	1.0
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	15.7	-	4.6	5.9	4.8	0.5	4.3	6.0	70.2	3.8	1.2
Numerically controlled or computer numerically controlled machines . . . . .	39.4	11,994	5.3	14.2	19.2	0.8	3.4	5.3	48.8	3.1	2.0
Materials working lasers. . . . .	4.4	838	1.6	1.0	1.7	0.1	2.1	3.7	85.6	4.2	0.7
Pick and place robots . . . . .	16.4	7,359	4.1	5.2	6.7	0.4	5.9	6.8	67.4	3.6	1.2
Other robots. . . . .	4.5	3,557	1.2	1.7	1.4	0.1	5.2	4.9	80.3	5.1	0.6
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.1	-	0.8	0.8	0.5	0.1	1.4	4.6	88.0	3.9	0.5
Automatic guided vehicle systems. . . . .	1.4	-	0.2	0.7	0.5	-	0.5	1.3	92.7	4.0	0.3
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	14.8	-	4.2	4.9	5.1	0.6	6.2	7.6	67.4	4.0	1.2
Performed on final product . . . . .	18.1	-	5.3	5.8	6.1	0.8	7.5	8.5	62.7	3.3	1.3
Communication and control:											
Local area network for technical data . . . . .	25.3	-	8.4	11.5	4.5	0.9	10.2	7.3	53.5	3.7	1.8
Local area network for factory use . . . . .	24.5	-	9.9	7.8	5.8	1.1	11.3	8.6	52.1	3.6	1.7
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	26.1	-	8.7	10.3	6.4	0.8	11.3	9.1	50.0	3.5	1.7
Programmable controllers . . . . .	45.1	46,919	8.1	16.1	18.9	1.9	3.5	3.8	45.0	2.8	2.0
Computers used for control on the factory floor . . . . .	30.4	12,407	9.5	10.2	9.3	1.4	10.9	9.8	45.6	3.2	1.7
<b>\$5 TO \$100</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	53.6	22,078	13.8	25.2	13.8	0.8	5.4	6.3	32.5	2.3	1.6
CAD output used to control manufacturing machines . . . . .	27.4	8,109	6.7	12.0	8.1	0.7	6.7	9.6	52.9	3.3	1.5
Digital representation of CAD output used in procurement . . . . .	9.3	-	3.5	3.5	1.7	0.5	4.4	7.9	73.1	5.3	0.9
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	15.7	-	5.5	5.8	3.8	0.5	5.2	7.0	68.3	3.8	1.0
Numerically controlled or computer numerically controlled machines . . . . .	51.1	46,083	4.7	13.1	31.5	1.9	2.9	4.4	39.5	2.2	1.6
Materials working lasers. . . . .	6.1	4,230	2.3	1.3	2.3	0.3	2.9	5.9	81.1	3.9	0.7
Pick and place robots . . . . .	14.7	16,537	3.3	5.3	5.7	0.4	5.1	7.6	68.9	3.7	0.9
Other robots. . . . .	6.0	5,793	1.2	2.5	2.0	0.3	4.2	6.6	78.9	4.2	0.4
Automated material handling:											
Automatic storage and retrieval systems . . . . .	1.9	-	0.4	0.5	0.8	0.1	1.5	5.0	87.8	3.8	0.2
Automatic guided vehicle systems. . . . .	1.1	-	0.2	0.4	0.4	0.1	0.5	2.7	91.9	3.8	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	10.5	-	2.2	4.0	3.8	0.4	3.5	9.1	73.2	3.7	0.8
Performed on final product . . . . .	13.3	-	3.3	4.6	4.9	0.4	4.9	8.5	69.5	3.8	0.9
Communication and control:											
Local area network for technical data . . . . .	24.2	-	10.1	9.1	4.3	0.7	10.0	8.0	54.3	3.5	1.1
Local area network for factory use . . . . .	20.7	-	7.5	8.0	4.4	0.8	12.4	9.7	53.9	3.3	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	22.3	-	9.7	7.1	4.4	1.1	10.2	10.9	53.0	3.6	1.2
Programmable controllers . . . . .	36.1	69,073	6.8	11.9	15.4	2.0	4.6	5.5	50.6	3.2	1.4
Computers used for control on the factory floor . . . . .	29.8	21,930	7.8	11.8	8.5	1.7	10.9	10.6	45.9	2.9	1.4

See footnotes at the end of the table.

Table 4K. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS—Continued

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within				
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use	Not specified	
<b>\$101 TO \$1,000</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE).....	63.6	23,820	14.6	28.7	18.8	1.5	4.1	6.0	25.0	1.3	1.8
CAD output used to control manufacturing machines .....	27.0	6,451	6.2	11.5	8.7	0.6	7.0	9.7	53.9	2.4	1.6
Digital representation of CAD output used in procurement.....	11.6	-	4.4	5.2	1.8	0.2	4.6	7.1	73.3	3.4	1.1
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems.....	13.6	-	4.0	5.4	4.0	0.2	4.3	6.8	72.4	3.0	1.1
Numerically controlled or computer numerically controlled machines .....	54.6	53,908	5.4	12.3	35.5	1.4	2.0	3.7	38.1	1.6	1.7
Materials working lasers.....	6.3	1,113	1.5	1.4	3.1	0.3	2.2	4.3	83.8	3.3	0.7
Pick and place robots .....	6.5	3,988	1.5	2.3	2.5	0.2	3.7	4.1	82.5	3.2	0.5
Other robots.....	5.6	2,586	1.3	2.0	2.2	0.1	2.4	3.9	85.4	2.7	0.6
Automated material handling:											
Automatic storage and retrieval systems .....	3.0	-	0.6	1.3	0.9	0.1	0.7	3.4	90.4	2.6	0.5
Automatic guided vehicle systems.....	0.8	-	0.1	0.4	0.3	-	0.8	1.7	93.9	2.8	0.1
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials.....	10.3	-	2.3	3.6	4.0	0.3	4.1	5.4	77.3	2.9	0.9
Performed on final product .....	13.8	-	2.4	4.7	6.3	0.4	4.7	6.5	72.0	2.9	1.1
Communication and control:											
Local area network for technical data .....	29.6	-	10.3	11.5	6.3	1.5	9.4	7.3	51.0	2.7	1.5
Local area network for factory use .....	25.3	-	9.8	8.8	5.7	1.1	10.8	9.6	51.1	3.2	1.4
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers.....	16.4	-	7.7	4.4	3.7	0.6	8.4	12.1	60.4	2.7	1.2
Programmable controllers .....	30.6	43,064	5.5	9.9	13.2	1.9	4.0	6.3	56.5	2.7	1.5
Computers used for control on the factory floor .....	28.1	15,696	7.4	10.8	9.2	0.7	10.3	10.9	48.2	2.4	1.5
<b>\$1,001 TO \$2,000</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE).....	68.3	7,543	13.7	31.1	22.8	0.6	3.7	4.9	22.2	0.9	3.7
CAD output used to control manufacturing machines .....	26.8	2,125	5.7	11.7	8.9	0.5	6.4	6.7	58.0	2.2	2.9
Digital representation of CAD output used in procurement.....	17.9	-	4.9	10.0	2.8	0.2	3.1	7.4	68.0	3.6	2.5
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems.....	13.3	-	3.3	5.0	4.7	0.4	4.3	5.4	73.7	3.3	2.1
Numerically controlled or computer numerically controlled machines .....	43.7	7,164	2.6	12.7	27.2	1.3	3.2	6.8	45.0	1.4	3.4
Materials working lasers.....	4.9	247	1.9	1.3	1.5	0.1	1.5	5.8	85.9	1.9	0.9
Pick and place robots .....	6.1	488	1.5	2.7	1.5	0.3	2.7	3.7	83.9	3.7	1.0
Other robots.....	4.3	362	0.4	2.3	1.5	-	2.6	2.7	86.7	3.8	0.8
Automated material handling:											
Automatic storage and retrieval systems .....	3.9	-	0.3	2.4	1.1	-	1.6	2.6	89.9	2.1	0.9
Automatic guided vehicle systems.....	1.0	-	0.1	0.2	0.7	-	0.8	0.7	95.2	2.3	0.3
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials.....	10.5	-	2.2	5.4	2.4	0.5	4.1	4.0	78.4	3.1	1.7
Performed on final product .....	13.6	-	2.2	6.7	4.4	0.3	3.5	5.2	75.5	2.2	1.9
Communication and control:											
Local area network for technical data .....	30.7	-	10.2	14.0	4.1	2.4	9.8	4.7	52.9	1.8	2.8
Local area network for factory use .....	22.3	-	7.3	10.7	3.3	1.0	8.8	8.2	58.5	2.2	2.3
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers.....	16.2	-	6.2	7.0	1.5	1.5	6.2	13.4	61.5	2.7	1.8
Programmable controllers .....	23.5	4,490	4.0	9.2	9.8	0.5	3.8	5.4	64.8	2.5	2.4
Computers used for control on the factory floor .....	26.3	3,809	8.3	10.2	6.3	1.5	8.7	6.2	56.8	2.0	2.5

See footnotes at the end of the table.



Table 4K. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS—Continued**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within				
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use	Not specified	
<b>\$2,001 TO \$10,000</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . . .	73.5	18,352	12.5	32.9	27.8	0.4	5.8	3.8	15.6	1.2	2.3
CAD output used to control manufacturing machines . . . . .	31.1	4,046	7.5	13.6	9.8	0.1	8.3	9.1	48.5	2.9	2.1
Digital representation of CAD output used in procurement . . . . .	14.3	-	5.7	5.3	2.8	0.5	7.0	7.4	67.1	4.2	1.4
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	11.7	-	3.5	3.6	3.7	0.8	5.2	5.2	75.0	3.1	1.2
Numerically controlled or computer numerically controlled machines . . . . .	54.9	16,045	5.9	14.1	34.2	0.7	1.5	2.9	38.9	1.9	2.3
Materials working lasers. . . . .	4.0	254	0.7	1.4	1.7	0.2	2.2	5.8	84.7	3.2	0.6
Pick and place robots . . . . .	4.2	708	0.6	1.4	2.0	0.2	2.0	3.9	86.6	3.3	0.6
Other robots. . . . .	3.5	418	0.7	1.0	1.7	0.1	3.8	4.5	84.9	3.3	0.4
Automated material handling:											
Automatic storage and retrieval systems . . . . .	2.5	-	0.5	0.8	1.2	0.1	1.1	2.7	91.0	2.6	0.3
Automatic guided vehicle systems . . . . .	1.2	-	0.3	0.3	0.4	0.2	0.2	1.3	94.1	3.2	0.3
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	8.0	-	2.4	2.9	2.6	-	3.4	7.0	78.1	3.4	1.0
Performed on final product . . . . .	9.7	-	2.7	3.2	3.5	0.3	4.3	7.0	75.7	3.2	1.1
Communication and control:											
Local area network for technical data . . . . .	34.7	-	12.0	15.2	6.7	0.8	8.6	7.5	46.4	2.8	2.0
Local area network for factory use . . . . .	23.2	-	8.3	8.3	5.8	0.8	8.3	10.7	54.5	3.3	1.6
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	14.9	-	7.2	4.5	2.6	0.7	6.9	12.1	62.7	3.4	1.5
Programmable controllers . . . . .	24.5	11,807	4.6	8.1	10.4	1.4	4.5	4.9	62.9	3.2	1.7
Computers used for control on the factory floor . . . . .	27.3	6,326	6.4	10.0	9.5	1.4	10.0	7.9	51.7	3.2	1.9
<b>OVER \$10,000</b>											
Design and engineering:											
Computer-aided design (CAD) or computer-aided engineering (CAE). . . . .	83.3	84,709	12.6	35.1	34.6	1.1	2.9	2.5	10.8	0.5	1.3
CAD output used to control manufacturing machines . . . . .	33.8	12,477	6.8	13.8	12.8	0.4	7.8	9.9	45.9	2.5	1.5
Digital representation of CAD output used in procurement . . . . .	17.6	-	5.0	7.2	4.8	0.6	7.2	8.8	62.5	3.9	1.2
Fabrication/machining and assembly:											
Flexible manufacturing cells or systems. . . . .	11.8	-	3.3	3.6	4.7	0.2	3.2	4.6	76.7	3.7	0.9
Numerically controlled or computer numerically controlled machines . . . . .	54.2	33,211	3.7	10.7	38.7	1.1	2.6	2.8	38.3	2.0	1.6
Materials working lasers. . . . .	4.6	1,065	1.0	1.6	1.7	0.2	2.8	5.5	84.1	3.0	0.5
Pick and place robots . . . . .	4.3	2,230	0.5	1.6	2.2	0.1	2.8	2.5	87.2	3.1	0.3
Other robots. . . . .	5.5	7,929	0.8	1.7	2.8	0.1	2.6	2.7	86.0	3.2	0.4
Automated material handling:											
Automatic storage and retrieval systems . . . . .	4.8	-	0.8	1.1	2.8	0.1	1.2	2.3	88.8	2.9	0.3
Automatic guided vehicle systems . . . . .	1.9	-	0.1	0.6	1.0	0.1	0.8	1.0	93.3	3.1	0.2
Automatic sensor-based inspection or testing:											
Performed on incoming or in-process materials. . . . .	10.7	-	2.7	3.0	4.8	0.3	3.1	4.9	78.4	2.9	0.9
Performed on final product . . . . .	12.7	-	3.2	4.6	4.5	0.4	3.2	4.7	76.0	3.4	1.0
Communication and control:											
Local area network for technical data . . . . .	48.2	-	14.6	18.9	12.6	2.1	7.8	6.4	35.8	1.8	1.6
Local area network for factory use . . . . .	28.0	-	7.6	10.5	8.7	1.1	10.5	9.7	49.4	2.5	1.3

See footnotes at the end of the table.

Table 4K. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS—Continued**

Technology	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>2</sup>
			When technology was first implemented				Plan to use within				
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>1</sup>	2 years	2 to 5 years	No plans to use	Not specified	
<b>OVER \$10,000—Cont.</b>											
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers. . . . .	18.5	-	7.7	6.9	3.4	0.5	8.8	12.0	57.6	3.0	1.2
Programmable controllers . . . . .	30.0	35,960	3.3	9.3	15.7	1.7	4.0	4.5	59.1	2.4	1.4
Computers used for control on the factory floor . . . . .	30.1	32,342	6.2	10.8	12.0	1.1	8.8	7.3	51.3	2.5	1.4

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 4L. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>LESS THAN \$5</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	46.3	18.6	19.3	2.4	4.6	1.8	2.0
CAD output used to control manufacturing machines . . . . .	19.1	7.4	8.4	1.3	1.1	1.4	1.6
Digital representation of CAD output used in procurement. . . . .	7.6	3.6	2.5	0.2	1.1	0.2	1.0
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	15.7	3.7	6.9	3.6	0.7	1.1	1.2
Numerically controlled or computer numerically controlled machines . . . . .	39.4	18.2	12.6	4.1	2.2	2.6	2.0
Materials working lasers. . . . .	4.4	1.8	0.8	0.5	1.1	0.2	0.7
Pick and place robots. . . . .	16.4	2.4	6.5	6.1	0.3	1.2	1.2
Other robots . . . . .	4.5	1.2	1.6	1.1	0.3	0.3	0.6
Automated material handling:							
Automatic storage and retrieval systems . . . . .	2.1	0.2	0.3	0.8	0.9	0.1	0.5
Automatic guided vehicle systems. . . . .	1.4	0.2	0.5	0.3	0.3	-	0.3
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	14.8	12.2	1.1	0.5	0.2	1.0	1.2
Performed on final product . . . . .	18.1	13.8	1.6	0.7	0.4	1.6	1.3
Communication and control:							
Local area network for technical data. . .	25.3	8.4	8.9	2.0	4.1	2.1	1.8
Local area network for factory use . . . .	24.5	8.2	8.8	2.0	3.9	1.8	1.7
Intercompany computer network linking plant to subcontractors, supplies, and/or customers . . . . .	26.1	5.9	5.5	4.1	8.5	2.1	1.7
Programmable controllers . . . . .	45.1	16.3	15.2	4.7	5.2	3.8	2.0
Computers used for control on the factory floor . . . . .	30.4	13.0	8.0	2.5	4.4	2.7	1.7
<b>\$5 TO \$100</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	53.6	24.7	20.9	2.9	2.9	2.4	1.6
CAD output used to control manufacturing machines . . . . .	27.4	11.9	10.4	2.3	1.2	1.9	1.5
Digital representation of CAD output used in procurement. . . . .	9.3	4.8	2.9	0.5	0.6	0.5	0.9
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	15.7	4.8	5.9	3.0	0.9	1.3	1.0
Numerically controlled or computer numerically controlled machines . . . . .	51.1	19.0	21.6	6.3	1.6	4.0	1.6
Materials working lasers. . . . .	6.1	2.5	1.1	1.0	1.1	0.6	0.7
Pick and place robots. . . . .	14.7	2.5	6.0	4.9	0.4	1.0	0.9
Other robots . . . . .	6.0	1.7	2.0	1.7	0.2	0.5	0.4
Automated material handling:							
Automatic storage and retrieval systems . . . . .	1.9	0.3	0.8	0.4	0.2	0.1	0.2
Automatic guided vehicle systems. . . . .	1.1	-	0.4	0.3	0.3	-	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	10.5	8.2	0.6	0.5	0.6	0.5	0.8

See footnotes at the end of the table.



Table 4L. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
\$5 TO \$100—Cont.							
Automatic sensor-based inspection or testing:—Cont.							
Performed on final product . . . . .	13.3	10.9	0.7	0.6	0.5	0.7	0.9
Communication and control:							
Local area network for technical data. . .	24.2	8.2	9.0	1.7	3.8	1.7	1.1
Local area network for factory use . . . .	20.7	7.1	7.2	1.5	3.8	1.3	1.1
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	22.3	5.9	5.4	2.3	6.5	2.3	1.2
Programmable controllers . . . . .	36.1	14.2	11.5	3.2	3.9	3.6	1.4
Computers used for control on the factory floor . . . . .	29.8	11.5	8.3	3.5	3.7	3.2	1.4
\$101 TO \$1,000							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	63.6	30.5	25.0	3.6	2.5	2.1	1.8
CAD output used to control manufacturing machines . . . . .	27.0	12.1	10.6	2.2	0.9	1.3	1.6
Digital representation of CAD output used in procurement. . . . .	11.6	6.2	3.3	0.9	0.9	0.3	1.1
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	13.6	4.7	4.8	2.8	0.8	0.4	1.1
Numerically controlled or computer numerically controlled machines . . . . .	54.6	19.9	22.4	7.3	1.5	3.8	1.7
Materials working lasers. . . . .	6.3	3.3	1.8	0.3	0.5	0.4	0.7
Pick and place robots. . . . .	6.5	1.4	2.2	2.3	0.3	0.4	0.5
Other robots . . . . .	5.6	1.5	1.9	1.8	0.3	0.2	0.6
Automated material handling:							
Automatic storage and retrieval systems. . . . .	3.0	0.4	1.3	0.5	0.7	0.1	0.5
Automatic guided vehicle systems. . . . .	0.8	-	0.1	0.4	0.1	0.1	0.1
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	10.3	8.0	1.1	0.4	0.1	0.7	0.9
Performed on final product . . . . .	13.8	10.5	1.3	0.7	0.4	1.0	1.1
Communication and control:							
Local area network for technical data. . .	29.6	8.5	12.5	1.6	4.5	2.5	1.5
Local area network for factory use . . . .	25.3	7.4	9.6	1.4	4.1	2.8	1.4
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers . . . . .	16.4	5.1	3.6	1.7	4.9	1.1	1.2
Programmable controllers . . . . .	30.6	12.5	9.2	2.0	3.8	3.4	1.5
Computers used for control on the factory floor . . . . .	28.1	10.4	9.2	2.7	3.9	2.1	1.5
\$1,001 TO \$2,000							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	68.3	24.1	34.2	4.0	4.9	1.6	3.7
CAD output used to control manufacturing machines . . . . .	26.8	8.6	12.1	2.4	1.6	2.4	2.9
Digital representation of CAD output used in procurement. . . . .	17.9	10.3	4.9	1.5	0.9	0.3	2.5

See footnotes at the end of the table.

Table 4L. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS—Continued**

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>\$1,001 TO \$2,000—Cont.</b>							
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	13.3	2.3	6.7	2.1	1.5	0.9	2.1
Numerically controlled or computer numerically controlled machines .....	43.7	12.0	19.7	6.2	2.9	3.2	3.4
Materials working lasers.....	4.9	2.5	1.2	0.4	0.8	-	0.9
Pick and place robots.....	6.1	2.0	1.8	1.1	0.9	0.2	1.0
Other robots .....	4.3	1.6	1.1	1.4	-	0.2	0.8
Automated material handling:							
Automatic storage and retrieval systems .....	3.9	0.9	0.8	0.7	1.0	0.4	0.9
Automatic guided vehicle systems.....	1.0	-	0.2	0.6	-	0.1	0.3
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	10.5	7.4	1.3	0.6	0.7	0.6	1.7
Performed on final product .....	13.6	10.0	1.8	0.7	0.7	0.6	1.9
Communication and control:							
Local area network for technical data. . .	30.7	7.6	13.5	3.0	3.8	2.8	2.8
Local area network for factory use .....	22.3	6.0	9.5	2.3	2.6	2.1	2.3
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	16.2	2.9	6.0	1.3	4.6	1.4	1.8
Programmable controllers .....	23.5	8.1	8.4	3.0	2.9	1.2	2.4
Computers used for control on the factory floor .....	26.3	8.1	8.5	2.3	5.4	2.1	2.5
<b>\$2,001 TO \$10,000</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) ....	73.5	32.4	34.2	2.7	3.0	1.5	2.3
CAD output used to control manufacturing machines .....	31.1	12.7	14.0	3.4	0.5	0.8	2.1
Digital representation of CAD output used in procurement. ....	14.3	7.0	4.1	1.6	1.1	0.6	1.4
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems.	11.7	3.5	5.1	1.2	1.0	0.9	1.2
Numerically controlled or computer numerically controlled machines .....	54.9	18.0	27.8	7.6	0.6	1.4	2.3
Materials working lasers.....	4.0	2.2	1.3	0.3	0.1	0.1	0.6
Pick and place robots.....	4.2	0.6	1.8	1.8	0.1	-	0.6
Other robots .....	3.5	1.1	1.5	0.7	0.1	0.2	0.4
Automated material handling:							
Automatic storage and retrieval systems .....	2.5	0.4	1.1	0.6	0.4	-	0.3
Automatic guided vehicle systems.....	1.2	0.2	0.3	0.4	0.1	0.3	0.3
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials .....	8.0	6.1	1.0	0.3	-	0.5	1.0
Performed on final product .....	9.7	7.4	1.0	0.6	0.2	0.4	1.1
Communication and control:							
Local area network for technical data. . .	34.7	8.8	17.9	2.0	3.9	2.1	2.0
Local area network for factory use .....	23.2	5.8	11.3	2.1	2.8	1.2	1.6
Intercompany computer network linking plant to subcontractors, suppliers, and/or customers .....	14.9	3.9	5.7	1.4	2.8	1.2	1.5
Programmable controllers .....	24.5	7.2	10.0	2.5	2.9	2.0	1.7
Computers used for control on the factory floor .....	27.3	8.2	11.8	2.9	2.3	2.2	1.9

See footnotes at the end of the table.

Table 4L. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: BY MARKET PRICE FOR MOST PRODUCTS—Continued

Technology	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>2</sup>
		Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>1</sup>	
<b>OVER \$10,000</b>							
Design and engineering:							
Computer-aided design (CAD) or computer-aided engineering (CAE) . . . .	83.3	33.5	39.1	4.6	3.8	3.2	1.3
CAD output used to control manufacturing machines . . . . .	33.8	14.6	13.6	3.8	1.0	1.0	1.5
Digital representation of CAD output used in procurement. . . . .	17.6	9.2	4.5	1.7	1.3	0.9	1.2
Fabrication/machining and assembly:							
Flexible manufacturing cells or systems. . . . .	11.8	2.8	5.1	2.7	0.9	0.4	0.9
Numerically controlled or computer numerically controlled machines . . . . .	54.2	16.9	25.6	8.0	1.9	2.5	1.6
Materials working lasers. . . . .	4.6	2.5	1.1	0.4	0.4	0.3	0.5
Pick and place robots. . . . .	4.3	1.1	1.4	1.6	0.2	0.1	0.3
Other robots . . . . .	5.5	1.9	1.4	1.6	0.3	0.3	0.4
Automated material handling:							
Automatic storage and retrieval systems . . . . .	4.8	0.5	2.0	1.6	0.4	0.3	0.3
Automatic guided vehicle systems. . . . .	1.9	0.3	0.4	0.7	0.2	0.2	0.2
Automatic sensor-based inspection or testing:							
Performed on incoming or in-process materials . . . . .	10.7	8.9	0.7	0.4	0.2	0.4	0.9
Performed on final product . . . . .	12.7	9.7	1.2	0.9	0.4	0.5	1.0
Communication and control:							
Local area network for technical data. . . . .	48.2	12.7	21.3	3.4	6.6	4.1	1.6
Local area network for factory use . . . . .	28.0	7.0	12.1	2.8	4.1	2.1	1.3
Intercompany computer network linking plant to subcontractors, supplies, and/or customers . . . . .	18.5	6.2	4.9	2.1	4.2	1.2	1.2
Programmable controllers . . . . .	30.0	11.3	10.1	2.5	3.1	3.0	1.4
Computers used for control on the factory floor . . . . .	30.1	12.6	11.2	2.0	2.2	2.3	1.4

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>"Not specified" includes data for nonrespondents.

<sup>2</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 5A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: COMPUTER-AIDED DESIGN (CAD) OR COMPUTER-AIDED ENGINEERING (CAE) SYSTEMS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within			Not specified	
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use		
All establishments. . . . .	42,991	57.9	179,466	12.1	25.8	19.1	0.9	4.5	4.9	23.5	9.2	0.7
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	46.6	30,373	12.9	20.3	12.7	0.7	5.1	5.9	32.2	10.3	1.6
35, Industrial Machinery and Equipment . . . . .	14,231	64.2	58,869	11.6	28.9	22.8	0.9	4.1	4.5	19.2	8.0	1.4
36, Electronic and Other Electric Equipment. . . . .	7,472	64.2	35,907	11.6	29.2	22.5	0.9	4.2	4.1	17.8	9.7	1.3
37, Transportation Equipment . . . . .	4,110	53.8	29,604	12.0	22.2	18.3	1.3	5.3	4.8	26.5	9.5	1.6
38, Instruments and Related Products. . . . .	3,988	65.5	24,712	12.8	30.2	21.5	1.0	3.3	4.3	17.8	9.1	1.5
Employment size:												
20 to 99. . . . .	30,502	49.5	56,340	12.3	22.8	13.5	0.9	4.7	5.8	29.7	10.2	1.0
100 to 499. . . . .	10,321	76.4	53,423	12.9	34.4	28.5	0.6	4.5	3.1	9.5	6.6	0.7
500 and over. . . . .	2,168	87.2	69,703	6.2	26.5	53.2	1.3	1.0	0.3	3.8	7.7	0.5
Age of plant (years):												
Less than 5 . . . . .	4,893	63.4	22,297	19.0	31.1	12.3	1.0	5.7	4.8	23.7	2.3	2.3
5 to 15. . . . .	13,722	62.0	43,543	12.8	28.4	19.8	1.0	5.2	5.6	25.3	2.0	1.4
16 to 30. . . . .	11,303	64.4	47,694	11.9	29.3	22.3	0.9	4.8	4.3	24.8	1.7	1.5
Over 30 . . . . .	9,310	63.1	63,792	12.5	25.0	25.0	0.6	4.1	6.6	25.0	1.2	1.6
Not specified. . . . .	3,763	3.2	2,139	0.4	0.6	1.3	0.9	0.4	-	9.2	87.2	0.9
Manufacturing process:												
Fabrication/machining. . . . .	6,795	51.4	13,152	13.1	22.9	13.9	1.5	4.5	7.8	35.0	1.1	2.2
Assembly. . . . .	6,388	67.3	35,930	13.8	32.6	20.4	0.5	4.4	3.6	22.7	2.0	1.6
Both. . . . .	23,393	69.0	122,793	13.9	29.9	24.4	0.8	5.3	5.3	18.8	1.5	1.0
Neither. . . . .	2,577	29.2	5,354	6.2	13.0	8.4	1.6	3.4	3.3	58.7	5.4	2.9
Not specified. . . . .	3,838	4.9	2,237	0.8	3.0	0.8	0.3	0.3	0.1	9.2	85.4	0.9
Market for most products:												
Consumer . . . . .	4,358	48.3	9,297	12.6	24.1	10.5	1.1	4.8	7.0	35.8	4.2	2.2
Commercial . . . . .	5,791	66.3	23,786	13.4	30.8	21.3	0.8	2.8	4.9	24.7	1.4	2.0
Industrial . . . . .	18,796	64.4	78,851	12.6	28.4	22.4	1.0	5.4	5.0	23.8	1.5	1.2
Transportation . . . . .	3,974	64.3	22,060	15.7	26.4	21.0	1.2	6.2	5.8	22.9	0.8	2.3
Government. . . . .	2,141	74.0	26,612	13.8	30.9	28.5	0.8	1.4	4.8	18.3	1.5	2.9
Other . . . . .	3,679	63.6	14,230	14.8	29.0	19.3	0.5	5.8	4.8	23.3	2.4	2.4
Not specified. . . . .	4,252	9.0	4,629	1.5	3.5	3.7	0.3	0.9	1.7	11.4	76.9	1.1
Market price for most products:												
Less than \$5 . . . . .	5,274	46.3	18,568	12.9	20.3	12.9	0.2	7.4	6.9	36.7	2.8	2.0
\$5 to \$100. . . . .	10,422	53.5	22,078	13.8	25.1	13.8	0.8	5.4	6.3	32.5	2.3	1.6
\$101 to \$1,000 . . . . .	8,846	63.6	23,820	14.6	28.7	18.8	1.5	4.1	6.0	25.0	1.3	1.8
\$1,001 to \$2,000 . . . . .	2,023	68.2	7,543	13.7	31.1	22.8	0.6	3.7	4.9	22.2	0.9	3.7
\$2,001 to \$10,000 . . . . .	4,265	73.6	18,352	12.5	32.9	27.8	0.4	5.8	3.8	15.6	1.2	2.3
Over \$10,000. . . . .	7,340	83.4	84,709	12.6	35.1	34.6	1.1	2.9	2.5	10.8	0.5	1.3
Not specified. . . . .	4,821	12.3	4,395	1.4	5.2	5.0	0.7	1.8	2.1	14.0	69.8	1.6
Products made to military specifications:												
Yes . . . . .	14,112	69.1	83,121	14.1	29.2	24.6	1.2	5.2	6.0	18.4	1.4	1.3
No . . . . .	22,214	60.6	84,418	13.1	27.8	19.1	0.6	4.7	4.7	28.0	2.0	1.0
Don't know . . . . .	2,939	52.9	9,430	10.0	25.8	15.4	1.7	4.8	6.7	33.6	2.0	3.1
Not specified. . . . .	3,726	3.4	2,496	0.8	0.8	1.6	0.2	0.2	0.5	8.3	87.7	0.7
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	70.0	85,633	14.6	29.2	25.3	0.9	5.8	5.8	17.0	1.5	1.5
26 to 75 percent . . . . .	2,499	78.6	14,901	16.2	30.0	29.5	2.9	2.6	3.0	15.6	0.2	2.8
Over 75 percent. . . . .	1,148	62.1	3,957	11.1	26.4	23.6	1.0	3.4	8.0	26.1	0.3	5.2
None . . . . .	11,808	56.0	39,114	11.9	26.0	17.2	0.9	4.8	5.6	31.4	2.2	1.5
Don't know . . . . .	13,573	61.5	52,708	13.1	29.0	18.8	0.6	4.9	5.1	26.7	1.8	1.3
Not specified. . . . .	4,029	7.5	3,152	1.3	3.3	2.7	0.2	0.2	0.2	10.1	82.1	1.1

See footnotes at the end of the table.

Table 5A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: COMPUTER-AIDED DESIGN (CAD) OR COMPUTER-AIDED ENGINEERING (CAE) SYSTEMS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within			Not specified	
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use		
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	46.7	23,643	11.2	21.6	13.1	0.8	4.8	6.8	39.1	2.6	1.6
Less than 10 percent .....	15,360	65.8	70,520	15.1	29.0	21.0	0.7	5.8	5.4	21.8	1.3	1.2
10 to 19 percent .....	4,737	77.7	28,141	14.5	34.2	27.1	1.9	4.7	3.6	12.8	1.1	1.7
20 to 49 percent .....	3,912	85.6	36,867	12.7	38.1	33.7	1.1	2.5	3.3	7.6	1.0	1.6
50 percent or more .....	1,398	79.6	15,170	11.5	34.3	33.5	0.3	4.2	1.2	13.8	1.1	3.2
Not specified .....	3,897	6.3	5,123	0.5	2.1	3.3	0.4	0.2	0.5	7.9	85.1	0.9
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	43.8	3,008	13.9	20.6	8.6	0.7	5.0	5.5	44.2	1.5	3.8
In the plant .....	25,416	72.1	143,509	14.7	31.7	24.7	1.0	5.0	5.1	16.1	1.6	0.9
Elsewhere in the firm .....	4,969	65.4	25,178	13.5	28.4	22.6	0.9	4.5	4.3	24.4	1.5	1.8
No research and development done .....	7,046	34.1	7,172	7.5	17.2	8.7	0.7	4.7	6.9	52.2	2.1	2.2
Not specified .....	3,726	2.4	598	0.3	0.8	1.0	0.3	0.2	0.1	8.2	89.0	0.6
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	63.6	134,319	13.4	28.0	21.2	1.0	5.0	5.3	24.2	1.9	0.9
Elsewhere in the firm .....	1,099	74.2	11,154	12.3	28.7	33.1	0.1	1.9	3.5	19.5	1.0	3.8
Outside the firm .....	3,506	71.8	21,962	14.3	33.6	22.3	1.6	7.4	3.1	16.9	0.9	2.6
No formal training for staff. . .	5,251	51.3	11,129	11.4	25.0	14.4	0.5	3.3	7.2	36.9	1.3	2.4
Not specified .....	3,686	3.4	901	0.8	0.9	1.5	0.2	0.4	0.2	6.3	89.6	0.7
Who conducts most of the formal training for the staff:												
Staff from inside the plant . . .	26,952	62.1	117,631	13.2	27.5	20.4	1.0	5.2	5.4	25.2	2.0	1.0
Staff from outside the plant. . .	1,637	72.4	14,260	15.3	29.1	27.6	0.4	3.3	3.3	21.0	0.1	3.0
Trainers from outside the firm .	5,287	76.8	34,541	14.1	34.8	26.6	1.3	5.4	3.3	13.8	0.7	1.9
Not specified .....	9,115	31.6	13,033	7.1	14.8	9.3	0.4	2.2	4.5	24.5	37.2	1.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	54.1	51,534	11.2	24.8	17.6	0.5	4.1	5.4	34.3	2.1	1.3
Some problems .....	19,836	69.1	107,364	13.7	30.9	23.1	1.4	5.1	5.0	19.6	1.2	1.1
Very difficult .....	5,401	64.7	19,376	16.7	26.6	21.2	0.2	6.2	6.4	20.4	2.2	2.2
Not specified .....	3,849	4.0	1,190	0.8	1.6	1.4	0.2	0.3	0.1	9.5	86.2	0.8
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	77.0	20,394	14.8	33.9	27.4	0.9	1.7	3.2	17.0	1.1	1.9
No .....	34,703	61.2	147,466	13.2	27.3	19.8	0.9	5.1	5.7	26.2	1.8	0.8
Don't know .....	1,447	73.4	10,904	10.1	32.9	28.6	1.8	6.6	1.0	19.0	0.1	3.2
Not specified .....	3,576	2.4	702	0.4	0.8	1.1	0.1	0.2	0.1	5.1	92.2	0.6

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



**Table 5B. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: COMPUTER-AIDED DESIGN (CAD) OR COMPUTER-AIDED ENGINEERING (CAE) SYSTEMS**

Establishment characteristic	Number of establishments <sup>1</sup>	Percent distribution						Absolute standard error of "Used in operations" (percent) <sup>3</sup>
		Used in operations	Single most significant reason for using the technology					
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments. . . . .	42,991	57.9	24.9	24.7	3.1	3.0	2.1	0.7
Major Group:								
34, Fabricated Metal Products. . . . .	13,190	46.5	20.5	19.6	2.7	2.5	1.2	1.6
35, Industrial Machinery and Equipment . . .	14,231	64.1	27.5	27.5	3.4	3.3	2.5	1.4
36, Electronic and Other Electric Equip- ment. . . . .	7,472	64.2	27.4	27.6	3.9	3.0	2.3	1.3
37, Transportation Equipment . . . . .	4,110	53.9	22.7	22.2	2.8	3.7	2.4	1.6
38, Instruments and Related Products. . . . .	3,988	65.4	27.4	29.0	2.5	3.3	3.2	1.5
Employment size:								
20 to 99. . . . .	30,502	49.5	22.8	20.0	2.5	2.5	1.8	1.0
100 to 499. . . . .	10,321	76.4	29.1	35.7	3.9	4.2	3.0	0.7
500 and over. . . . .	2,168	87.2	33.8	40.0	8.9	4.5	2.4	0.5
Age of plant (years):								
Less than 5 . . . . .	4,893	63.5	28.2	26.8	3.6	2.4	2.5	2.3
5 to 15. . . . .	13,722	62.0	26.8	26.8	2.9	3.5	2.0	1.4
16 to 30. . . . .	11,303	64.4	27.2	27.4	3.6	3.5	2.6	1.5
Over 30 . . . . .	9,310	63.1	27.0	27.0	3.9	3.1	2.1	1.6
Not specified . . . . .	3,763	3.2	1.1	1.1	0.1	0.1	0.8	0.9
Manufacturing process:								
Fabrication/machining . . . . .	6,795	51.5	25.8	17.9	3.8	1.9	2.0	2.2
Assembly. . . . .	6,388	67.3	29.0	29.9	3.6	3.1	1.7	1.6
Both. . . . .	23,393	69.0	28.3	31.0	3.6	3.7	2.4	1.0
Neither. . . . .	2,577	29.3	14.5	7.9	0.9	3.8	2.2	2.9
Not specified . . . . .	3,838	4.9	2.3	1.3	0.2	0.1	1.1	0.9
Market for most products:								
Consumer . . . . .	4,358	48.2	20.9	18.5	3.7	2.9	2.0	2.2
Commercial . . . . .	5,791	66.3	29.2	28.9	2.6	3.5	2.1	2.0
Industrial . . . . .	18,796	64.3	26.3	29.9	3.1	3.1	2.0	1.2
Transportation . . . . .	3,974	64.3	28.4	24.5	4.2	4.2	3.0	2.3
Government. . . . .	2,141	74.0	36.5	26.0	7.4	2.3	1.9	2.9
Other . . . . .	3,679	63.7	30.0	23.1	3.2	4.7	2.7	2.4
Not specified . . . . .	4,252	9.0	3.1	3.9	0.4	0.2	1.5	1.1
Market price for most products:								
Less than \$5 . . . . .	5,274	46.3	18.2	19.3	2.4	4.6	1.8	2.0
\$5 to \$100. . . . .	10,422	53.6	24.4	20.9	2.9	2.9	2.4	1.6
\$101 to \$1,000 . . . . .	8,846	63.6	30.4	25.0	3.6	2.5	2.1	1.8
\$1,001 to \$2,000 . . . . .	2,023	68.3	23.6	34.2	4.0	4.9	1.6	3.7
\$2,001 to \$10,000 . . . . .	4,265	73.5	32.2	34.2	2.7	3.0	1.5	2.3
Over \$10,000. . . . .	7,340	83.3	32.6	39.1	4.6	3.8	3.2	1.3
Not specified . . . . .	4,821	12.4	5.1	4.4	1.2	0.6	1.0	1.6
Products made to military specifications:								
Yes . . . . .	14,112	69.1	30.3	28.2	4.3	3.6	2.6	1.3
No . . . . .	22,214	60.6	25.1	27.3	2.8	3.2	2.1	1.0
Don't know . . . . .	2,939	52.9	26.7	18.2	3.5	2.6	1.9	3.1
Not specified . . . . .	3,726	3.4	1.1	1.8	0.1	0.1	0.2	0.7
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies that are prime contractors to Federal Defense Agencies:								
1 to 25 percent . . . . .	9,934	70.0	29.3	30.7	4.0	3.3	2.7	1.5
26 to 75 percent . . . . .	2,499	78.7	32.3	33.1	5.1	4.5	3.8	2.8
Over 75 percent. . . . .	1,148	62.1	31.9	22.5	3.1	2.9	1.7	5.2
None . . . . .	11,808	56.0	24.5	23.0	3.5	2.8	2.2	1.5
Don't know . . . . .	13,573	61.5	26.5	26.9	2.6	3.6	1.9	1.3
Not specified . . . . .	4,029	7.4	3.0	3.5	0.6	-	0.3	1.1
Percent of the total value of shipments that are exported for direct sale:								
None . . . . .	13,687	46.8	22.1	17.0	2.7	3.1	1.9	1.6
Less than 10 percent. . . . .	15,360	65.7	27.3	29.4	3.4	3.5	2.0	1.2
10 to 19 percent . . . . .	4,737	77.9	32.7	35.9	3.8	2.4	3.0	1.7
20 to 49 percent . . . . .	3,912	85.6	34.9	37.7	5.1	4.2	3.7	1.6
50 percent or more . . . . .	1,398	79.5	33.6	36.3	4.1	3.1	2.2	3.2
Not specified . . . . .	3,897	6.3	2.1	3.1	0.3	0.3	0.5	0.9

See footnotes at the end of the table.



Table 5B. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: COMPUTER-AIDED DESIGN (CAD) OR COMPUTER-AIDED ENGINEERING (CAE) SYSTEMS—Continued**

Establishment characteristic	Number of establishments <sup>1</sup>	Percent distribution						Absolute standard error of "Used in operations" (percent) <sup>3</sup>
		Used in operations	Single most significant reason for using the technology					
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Where is most of the research and development work for the plant done:								
Outside this plant . . . . .	1,834	43.7	21.5	14.8	2.8	2.3	2.3	3.8
In this plant . . . . .	25,416	72.2	30.0	32.7	3.5	3.6	2.4	0.9
Elsewhere in the firm . . . . .	4,969	65.4	27.2	27.3	4.1	4.4	2.5	1.8
No research and development done . . . . .	7,046	34.1	18.3	9.5	2.7	1.9	1.7	2.2
Not specified . . . . .	3,726	2.4	0.8	1.1	0.2	0.1	0.2	0.6
Where is most of the formal training for the staff conducted:								
In this plant . . . . .	29,449	63.6	28.1	26.7	3.5	3.1	2.2	0.9
Elsewhere in the firm . . . . .	1,099	74.2	32.4	33.2	3.8	3.6	1.1	3.8
Outside the firm . . . . .	3,506	71.8	28.3	33.0	3.9	4.1	2.4	2.6
No formal training for staff conducted . . . . .	5,251	51.3	19.3	22.5	2.8	3.8	3.0	2.4
Not specified . . . . .	3,686	3.5	1.2	1.7	0.1	0.2	0.2	0.7
Who conducts most of the formal training for the staff:								
Staff from inside the plant . . . . .	26,952	62.2	27.3	26.6	3.2	3.0	2.1	1.0
Staff from outside the plant . . . . .	1,637	72.3	34.1	28.8	4.2	3.4	1.9	3.0
Trainers from outside the firm . . . . .	5,287	76.8	31.8	33.0	4.9	4.4	2.6	1.9
Not specified . . . . .	9,115	31.6	11.9	13.7	1.7	2.3	2.0	1.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult . . . . .	13,905	54.1	23.7	23.0	3.1	2.5	1.8	1.3
Some problems . . . . .	19,836	69.1	29.7	29.7	3.7	3.3	2.8	1.1
Very difficult . . . . .	5,401	64.8	26.3	27.6	3.3	5.6	2.0	2.2
Not specified . . . . .	3,849	4.0	2.3	1.4	0.1	0.1	0.2	0.8
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes . . . . .	3,265	77.0	28.7	36.1	5.9	4.1	2.2	1.9
No . . . . .	34,703	61.2	26.6	25.9	3.2	3.2	2.3	0.8
Don't know . . . . .	1,447	73.4	33.1	28.9	2.8	4.7	3.9	3.2
Not specified . . . . .	3,576	2.5	1.1	1.1	0.1	0.1	0.1	0.6

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology"

Table 5C. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: COMPUTER-AIDED DESIGN (CAD) OUTPUT TO CONTROL MANUFACTURING MACHINES**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within			Not specified	
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use		
All establishments. . . . .	42,991	25.3	38,047	5.8	10.7	8.4	0.4	6.4	8.6	49.0	10.7	0.6
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	19.2	6,623	4.7	8.7	5.7	0.1	6.0	8.8	54.5	11.5	1.2
35, Industrial Machinery and Equipment . . . . .	14,231	34.8	14,151	7.5	14.5	12.3	0.5	7.1	9.1	39.5	9.5	1.4
36, Electronic and Other Electric Equipment. . . . .	7,472	21.5	7,742	4.5	10.6	6.0	0.4	5.8	7.1	54.0	11.6	1.1
37, Transportation Equipment . . . . .	4,110	25.5	6,705	6.7	8.5	9.6	0.7	6.2	9.4	48.3	10.7	1.3
38, Instruments and Related Products. . . . .	3,988	18.4	2,827	5.3	6.6	6.0	0.5	7.1	8.2	56.1	10.2	1.1
Employment size:												
20 to 99. . . . .	30,502	22.0	15,712	5.0	9.6	7.0	0.4	5.5	8.0	52.9	11.6	0.9
100 to 499 . . . . .	10,321	30.5	10,602	7.8	12.8	9.5	0.4	8.9	10.6	41.9	8.2	0.8
500 and over . . . . .	2,168	48.2	11,733	7.7	17.4	22.2	0.9	7.6	7.2	28.3	8.8	0.8
Age of plant (years):												
Less than 5 . . . . .	4,893	21.1	2,448	8.1	9.5	3.2	0.3	6.7	7.3	62.1	2.8	1.9
5 to 15 . . . . .	13,722	26.4	10,654	5.2	13.2	7.6	0.4	6.9	9.1	54.1	3.5	1.2
16 to 30 . . . . .	11,303	29.0	12,118	6.8	11.5	10.4	0.3	7.6	10.4	49.5	3.5	1.4
Over 30 . . . . .	9,310	31.4	12,583	6.7	11.1	13.1	0.5	6.6	9.7	49.4	2.9	1.4
Not specified . . . . .	3,763	1.0	244	0.1	0.1	-	0.8	0.5	0.3	10.5	87.6	0.7
Manufacturing process:												
Fabrication/machining. . . . .	6,795	32.1	7,054	6.9	12.7	11.9	0.6	6.1	8.4	50.0	3.2	2.1
Assembly. . . . .	6,388	10.8	3,473	2.1	5.6	3.0	0.1	4.8	6.1	75.0	3.3	0.8
Both. . . . .	23,393	33.0	26,041	8.0	14.0	10.6	0.4	8.3	10.9	45.0	2.7	0.9
Neither. . . . .	2,577	8.2	1,325	1.1	2.3	4.4	0.4	2.7	6.0	75.5	7.6	1.5
Not specified . . . . .	3,838	2.0	154	0.2	1.5	-	0.3	0.8	0.5	10.6	86.3	0.8
Market for most products:												
Consumer . . . . .	4,358	15.1	2,446	3.6	6.5	4.7	0.3	5.9	10.0	64.0	5.1	1.4
Commercial . . . . .	5,791	26.8	4,872	6.9	12.8	6.9	0.2	7.1	8.0	56.3	1.9	1.8
Industrial . . . . .	18,796	29.9	16,907	6.3	12.7	10.4	0.5	7.0	8.7	51.4	3.2	1.1
Transportation . . . . .	3,974	31.2	5,511	7.4	10.7	12.2	0.9	8.3	11.5	46.3	2.5	2.0
Government. . . . .	2,141	33.8	3,832	7.3	13.4	12.6	0.5	7.1	11.8	43.7	3.6	2.9
Other . . . . .	3,679	26.2	3,975	7.6	12.0	6.4	0.2	6.7	9.7	53.9	3.6	2.1
Not specified . . . . .	4,252	3.5	507	0.9	1.4	1.1	0.1	1.4	2.4	13.9	78.7	0.7
Market price for most products:												
Less than \$5 . . . . .	5,274	19.2	3,330	5.2	6.9	6.9	0.2	5.7	9.9	62.2	3.1	1.6
\$5 to \$100 . . . . .	10,422	27.5	8,109	6.7	12.0	8.1	0.7	6.7	9.6	52.9	3.3	1.5
\$101 to \$1,000 . . . . .	8,846	27.0	6,451	6.2	11.5	8.7	0.6	7.0	9.7	53.9	2.4	1.6
\$1,001 to \$2,000 . . . . .	2,023	26.8	2,125	5.7	11.7	8.9	0.5	6.4	6.7	58.0	2.2	2.9
\$2,001 to \$10,000 . . . . .	4,265	31.0	4,046	7.5	13.6	9.8	0.1	8.3	9.1	48.5	2.9	2.1
Over \$10,000. . . . .	7,340	33.8	12,477	6.8	13.8	12.8	0.4	7.8	9.9	45.9	2.5	1.5
Not specified . . . . .	4,821	6.0	1,510	1.0	3.4	1.6	-	1.9	1.2	18.4	72.6	1.2
Products made to military specifications:												
Yes . . . . .	14,112	36.1	21,331	8.0	14.3	12.9	0.9	8.3	11.1	42.2	2.3	1.3
No . . . . .	22,214	23.3	14,949	5.6	10.7	6.8	0.2	6.5	8.6	57.7	4.0	0.9
Don't know . . . . .	2,939	21.1	1,605	4.5	7.7	8.7	0.2	4.4	6.9	64.6	3.0	2.5
Not specified . . . . .	3,726	0.2	163	0.1	-	0.1	-	0.4	0.6	10.4	88.4	0.2
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	35.1	13,351	8.8	14.9	11.0	0.4	8.4	11.0	43.2	2.2	1.5
26 to 75 percent . . . . .	2,499	42.1	3,042	6.5	15.8	16.8	3.0	8.2	10.6	38.3	0.8	3.3
Over 75 percent. . . . .	1,148	42.0	1,585	9.4	16.4	15.1	1.1	5.5	8.6	42.0	1.7	4.9
None . . . . .	11,808	22.3	9,832	5.3	9.5	7.3	0.2	5.2	7.7	60.4	4.4	1.2
Don't know . . . . .	13,573	23.3	9,761	5.3	10.4	7.4	0.2	7.6	9.6	56.3	3.2	1.1
Not specified . . . . .	4,029	1.7	477	0.2	0.8	0.7	-	0.4	0.8	13.7	83.4	0.6

See footnotes at the end of the table.

Table 5C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: COMPUTER-AIDED DESIGN (CAD) OUTPUT TO CONTROL MANUFACTURING MACHINES—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within			Not specified	
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use		
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	27.4	10,285	5.9	12.1	8.9	0.5	5.3	7.9	55.8	3.5	1.4
Less than 10 percent .....	15,360	26.8	13,290	6.4	11.8	8.5	0.1	7.8	10.0	52.2	3.1	1.1
10 to 19 percent .....	4,737	29.1	5,155	6.9	10.0	11.1	1.1	7.5	11.0	50.0	2.3	1.7
20 to 49 percent .....	3,912	28.9	5,691	6.9	12.4	8.9	0.7	8.9	11.7	47.8	2.7	1.7
50 percent or more .....	1,398	30.5	3,144	7.1	12.1	11.3	-	7.9	6.4	51.8	3.4	2.9
Not specified .....	3,897	1.8	483	0.4	0.2	1.1	0.1	0.7	0.4	11.0	86.2	0.5
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	22.1	994	7.0	10.1	5.0	-	3.1	6.4	67.1	1.2	3.4
In the plant .....	25,416	29.0	25,206	6.9	12.0	9.6	0.5	7.9	10.3	49.5	3.2	0.8
Elsewhere in the firm .....	4,969	23.3	6,441	4.7	10.9	7.6	0.1	8.1	8.9	56.7	2.9	1.3
No research and development done .....	7,046	27.3	5,387	5.4	11.8	9.6	0.5	4.0	7.2	57.9	3.6	2.1
Not specified .....	3,723	0.3	19	0.1	0.1	0.1	-	0.2	0.4	9.8	89.4	0.1
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	28.4	29,949	6.5	11.7	9.8	0.4	6.8	9.5	51.8	3.4	0.8
Elsewhere in the firm .....	1,099	32.1	1,983	6.7	12.5	12.7	0.2	6.7	6.6	52.4	2.2	3.8
Outside the firm .....	3,506	29.6	3,611	6.6	15.1	6.8	1.1	10.9	11.0	46.6	1.8	2.5
No formal training for staff .....	5,251	20.9	2,436	5.6	9.1	6.1	0.1	5.2	7.9	62.5	3.5	2.0
Not specified .....	3,686	0.6	69	0.1	0.4	-	0.1	0.8	0.3	8.2	90.1	0.2
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	27.3	26,428	5.9	11.4	9.6	0.4	6.8	8.8	53.4	3.6	0.8
Staff from outside the plant .....	1,637	30.9	3,545	7.7	12.2	11.0	-	7.8	9.8	50.8	0.8	2.9
Trainers from outside the firm .....	5,287	33.9	5,258	8.2	15.4	9.4	0.9	9.9	13.4	41.0	1.7	1.9
Not specified .....	9,115	13.3	2,818	3.8	5.8	3.6	0.1	3.0	5.0	40.2	38.6	1.3
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	18.1	9,539	3.9	8.7	5.3	0.2	5.6	7.9	65.4	3.0	1.0
Some problems .....	19,836	31.7	22,516	7.6	13.0	10.4	0.7	7.5	10.1	47.7	3.0	1.0
Very difficult .....	5,401	38.0	5,876	8.3	14.9	14.5	0.3	9.0	10.9	38.1	4.1	2.3
Not specified .....	3,849	0.8	116	0.2	0.4	0.2	-	0.5	0.4	11.4	86.9	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	27.1	3,370	7.1	10.7	9.0	0.3	6.2	7.8	56.0	2.9	1.6
No .....	34,703	27.8	31,903	6.3	11.9	9.2	0.4	7.0	9.5	52.6	3.3	0.8
Don't know .....	1,447	25.5	2,765	6.6	9.8	8.1	1.0	9.5	9.7	52.5	2.8	2.2
Not specified .....	3,576	0.3	9	-	0.3	-	-	0.3	0.2	6.6	92.6	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 5D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: COMPUTER-AIDED DESIGN (CAD) OUTPUT TO CONTROL MANUFACTURING MACHINES**

Establishment characteristic	Number of establishments <sup>1</sup>	Percent distribution						Absolute standard error of "Used in operations" (percent) <sup>3</sup>
		Used in operations	Single most significant reason for using the technology					
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments . . . . .	42,991	25.3	10.5	10.3	2.3	1.0	1.3	0.6
Major Group:								
34, Fabricated Metal Products . . . . .	13,190	19.3	8.8	7.2	1.4	0.9	1.0	1.2
35, Industrial Machinery and Equip- ment . . . . .	14,231	34.8	13.1	15.3	3.4	1.0	1.9	1.4
36, Electronic and Other Electric Equip ment . . . . .	7,472	21.5	10.0	7.4	2.0	1.2	1.0	1.1
37, Transportation Equipment . . . . .	4,110	25.5	9.9	10.9	2.5	1.1	1.1	1.3
38, Instruments and Related Prod- ucts . . . . .	3,988	18.5	7.8	7.2	1.8	0.5	1.2	1.1
Employment size:								
20 to 99 . . . . .	30,502	22.0	9.1	8.8	2.0	0.7	1.3	0.9
100 to 499 . . . . .	10,321	30.3	12.1	13.0	2.3	1.5	1.3	0.8
500 and over . . . . .	2,168	48.1	21.0	17.4	6.4	1.8	1.8	0.8
Age of plant (years):								
Less than 5 . . . . .	4,893	21.1	9.1	8.2	1.6	0.5	1.6	1.9
5 to 15 . . . . .	13,722	26.4	10.8	11.2	2.4	1.1	0.9	1.2
16 to 30 . . . . .	11,303	29.0	12.0	11.7	2.6	1.0	1.7	1.4
Over 30 . . . . .	9,310	31.4	12.9	12.5	3.1	1.4	1.4	1.4
Not specified . . . . .	3,763	1.0	0.1	-	-	-	0.9	0.7
Manufacturing process:								
Fabrication/machining . . . . .	6,795	32.2	13.8	14.1	1.4	0.9	2.0	2.1
Assembly . . . . .	6,388	10.8	5.5	3.2	1.4	0.4	0.3	0.8
Both . . . . .	23,393	33.0	13.1	13.6	3.3	1.4	1.5	0.9
Neither . . . . .	2,577	8.1	4.0	2.8	0.8	0.1	0.4	1.5
Not specified . . . . .	3,838	1.9	0.5	0.4	-	-	1.0	0.8
Market for most products:								
Consumer . . . . .	4,358	15.1	7.0	4.5	2.2	0.8	0.7	1.4
Commercial . . . . .	5,791	26.7	12.7	9.6	2.1	1.2	1.1	1.8
Industrial . . . . .	18,796	29.8	12.1	12.7	2.3	1.0	1.6	1.1
Transportation . . . . .	3,974	31.3	10.8	14.3	3.0	1.0	2.2	2.0
Government . . . . .	2,141	33.8	13.4	10.7	7.8	1.2	0.8	2.9
Other . . . . .	3,679	26.1	10.8	12.2	1.2	1.4	0.5	2.1
Not specified . . . . .	4,252	3.6	1.4	0.9	0.3	-	1.0	0.7
Market price for most products:								
Less than \$5 . . . . .	5,274	19.1	6.9	8.4	1.3	1.1	1.4	1.6
\$5 to \$100 . . . . .	10,422	27.4	11.7	10.4	2.3	1.2	1.9	1.5
\$101 to \$1,000 . . . . .	8,846	27.0	12.0	10.6	2.2	0.9	1.3	1.6
\$1,001 to \$2,000 . . . . .	2,023	26.8	8.3	12.1	2.4	1.6	2.4	2.9
\$2,001 to \$10,000 . . . . .	4,265	31.1	12.5	14.0	3.4	0.5	0.8	2.1
Over \$10,000 . . . . .	7,340	33.8	14.3	13.6	3.8	1.0	1.0	1.5
Not specified . . . . .	4,821	6.0	2.1	2.5	0.4	0.5	0.5	1.2
Products made to military specifica- tions:								
Yes . . . . .	14,112	36.1	13.7	15.2	3.7	1.4	2.1	1.3
No . . . . .	22,214	23.3	10.0	9.3	1.8	0.9	1.2	0.9
Don't know . . . . .	2,939	21.1	11.2	7.0	2.1	0.4	0.5	2.5
Not specified . . . . .	3,726	0.3	0.1	-	-	-	0.1	0.2
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent . . . . .	9,934	35.1	14.3	14.7	2.4	1.6	2.1	1.5
26 to 75 percent . . . . .	2,499	42.2	13.5	17.1	6.2	0.6	4.8	3.3

See footnotes at end of table.

Table 5D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: COMPUTER-AIDED DESIGN (CAD) OUTPUT TO CONTROL MANUFACTURING MACHINES—Continued**

Establishment characteristic	Number of establishments <sup>1</sup>	Percent distribution						Absolute standard error of "Used in operations" (percent) <sup>3</sup>
		Used in operations	Single most significant reason for using the technology					
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:—Cont.								
Over 75 percent .....	1,148	42.1	15.1	19.6	3.4	2.6	1.5	4.9
None .....	11,808	22.2	9.5	8.9	2.3	0.7	0.8	1.2
Don't know .....	13,573	23.3	10.4	9.1	2.1	0.9	0.8	1.1
Not specified .....	4,029	1.8	0.9	0.7	-	-	0.1	0.6
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	27.4	12.3	10.0	2.4	1.2	1.5	1.4
Less than 10 percent .....	15,360	26.9	10.5	11.9	2.5	1.1	0.9	1.1
10 to 19 percent .....	4,737	29.2	12.3	11.4	2.6	0.6	2.3	1.7
20 to 49 percent .....	3,912	28.9	11.0	12.2	3.0	1.1	1.7	1.7
50 percent or more .....	1,398	30.5	12.0	13.3	1.7	0.7	2.7	2.9
Not specified .....	3,897	1.7	0.5	0.7	0.2	0.2	0.2	0.5
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	22.1	9.2	7.8	2.7	0.2	2.1	3.4
In this plant .....	25,416	29.1	11.6	12.2	2.6	1.2	1.4	0.8
Elsewhere in the firm .....	4,969	23.4	10.3	8.4	2.7	0.9	1.1	1.3
No research and development done ..	7,046	27.3	12.3	10.9	1.9	0.7	1.5	2.1
Not specified .....	3,726	0.2	0.1	0.1	-	-	0.1	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	28.5	11.8	11.5	2.5	1.1	1.5	0.8
Elsewhere in the firm .....	1,099	32.0	15.5	12.0	2.5	1.7	0.4	3.8
Outside the firm .....	3,506	29.5	10.9	12.8	2.5	1.3	2.1	2.5
No formal training for staff conducted .....	5,251	20.9	8.6	8.6	2.2	0.4	1.0	2.0
Not specified .....	3,686	0.5	0.1	0.2	0.2	-	0.1	0.2
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	27.4	11.5	11.0	2.4	1.0	1.4	0.8
Staff from outside the plant .....	1,637	30.9	13.6	11.5	2.9	2.0	0.9	2.9
Trainers from outside the firm .....	5,287	33.9	13.4	13.8	3.2	1.6	2.0	1.9
Not specified .....	9,115	13.2	5.1	5.8	1.3	0.3	0.8	1.3
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	18.1	8.5	6.6	1.5	0.6	0.8	1.0
Some problems .....	19,836	31.8	13.3	12.5	3.1	0.9	1.9	1.0
Very difficult .....	5,401	37.9	12.1	18.8	2.9	2.9	1.4	2.3
Not specified .....	3,849	0.7	0.3	0.4	0.1	-	-	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	27.1	10.6	11.6	2.8	0.8	1.3	1.6
No .....	34,703	27.7	11.5	11.2	2.5	1.1	1.5	0.6
Don't know .....	1,447	25.4	11.0	10.4	2.5	0.6	1.0	2.2
Not specified .....	3,576	0.3	0.3	-	-	-	-	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 5E. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: DIGITAL REPRESENTATION OF COMPUTER-AIDED DESIGN (CAD) OUTPUT USED IN PROCUREMENT ACTIVITIES**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (per-cent)	Percent distribution								Absolute standard error of "Used in operations" <sup>3</sup> (percent) <sup>3</sup>
			When technology was first implemented				Plan to use within				
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments.....	42,991	11.3	3.8	4.8	2.3	0.4	4.7	7.0	65.1	12.0	0.4
Major Group:											
34, Fabricated Metal Products...	13,190	7.1	2.5	3.4	0.9	0.3	3.7	6.3	70.6	12.4	0.8
35, Industrial Machinery and Equipment.....	14,231	11.7	3.5	4.7	3.0	0.5	5.4	6.8	64.0	12.1	0.9
36, Electronic and Other Electric Equipment.....	7,472	16.1	4.9	7.3	3.7	0.2	5.0	6.9	59.9	12.1	1.0
37, Transportation Equipment...	4,110	9.6	4.0	4.0	1.1	0.5	5.3	9.4	63.8	11.8	0.9
38, Instruments and Related Products.....	3,988	16.1	6.5	5.9	3.1	0.6	3.8	7.6	61.7	10.8	1.1
Employment size:											
20 to 99.....	30,502	8.9	3.0	4.0	1.5	0.4	3.6	5.6	68.8	13.1	0.6
100 to 499.....	10,321	14.1	5.2	5.5	3.2	0.2	7.2	10.5	58.9	9.4	0.5
500 and over.....	2,168	30.3	8.0	12.7	8.8	0.8	7.4	10.2	42.5	9.6	0.8
Age of plant (years):											
Less than 5.....	4,893	12.4	4.5	6.2	1.4	0.3	5.1	6.6	71.0	4.8	1.3
5 to 15.....	13,722	12.9	4.8	5.3	2.3	0.5	4.5	7.4	70.4	4.8	0.9
16 to 30.....	11,303	12.8	3.4	5.7	3.3	0.4	5.5	8.1	68.6	5.1	1.0
Over 30.....	9,310	10.5	3.8	4.0	2.5	0.2	5.4	8.0	71.8	4.2	0.8
Not specified.....	3,763	0.2	0.1	-	0.1	-	0.5	0.2	10.8	88.3	0.1
Manufacturing process:											
Fabrication/machining.....	6,795	9.4	1.8	4.6	2.1	0.9	3.7	5.4	76.1	5.3	1.2
Assembly.....	6,388	15.6	4.6	7.8	3.0	0.2	4.4	6.1	70.6	3.3	1.0
Both.....	23,393	13.0	4.9	5.1	2.7	0.3	6.0	9.1	67.5	4.4	0.7
Neither.....	2,577	4.3	1.9	1.2	1.0	0.2	2.1	4.4	80.2	9.0	1.2
Not specified.....	3,838	1.0	0.1	0.7	0.1	0.1	0.4	0.3	11.4	86.9	0.4
Market for most products:											
Consumer.....	4,358	8.4	2.7	2.6	2.8	0.3	4.5	6.2	75.1	5.9	1.2
Commercial.....	5,791	16.7	5.6	8.2	2.5	0.4	4.3	8.5	67.4	3.1	1.4
Industrial.....	18,796	11.2	3.8	4.6	2.3	0.5	4.9	7.0	72.2	4.7	0.8
Transportation.....	3,974	11.8	3.8	5.1	2.7	0.2	6.3	9.1	67.6	5.1	1.4
Government.....	2,141	19.1	7.9	7.5	3.6	0.1	5.6	7.5	62.7	5.1	2.1
Other.....	3,679	11.6	3.4	5.8	2.1	0.3	6.4	8.6	68.2	5.2	1.2
Not specified.....	4,252	1.3	0.4	0.4	0.4	0.1	1.1	2.1	16.5	79.0	0.4
Market price for most products:											
Less than \$5.....	5,274	7.7	1.6	4.0	1.8	0.3	4.3	7.5	75.2	5.3	1.0
\$5 to \$100.....	10,422	9.2	3.5	3.5	1.7	0.5	4.4	7.9	73.1	5.3	0.9
\$101 to \$1,000.....	8,846	11.6	4.4	5.2	1.8	0.2	4.6	7.1	73.3	3.4	1.1
\$1,001 to \$2,000.....	2,023	17.9	4.9	10.0	2.8	0.2	3.1	7.4	68.0	3.6	2.5
\$2,001 to \$10,000.....	4,265	14.3	5.7	5.3	2.8	0.5	7.0	7.4	67.1	4.2	1.4
Over \$10,000.....	7,340	17.6	5.0	7.2	4.8	0.6	7.2	8.8	62.5	3.9	1.2
Not specified.....	4,821	3.1	1.3	1.3	0.5	-	0.5	0.7	22.7	72.9	1.1
Products made to military specifications:											
Yes.....	14,112	14.6	5.0	6.1	2.9	0.6	7.0	9.1	64.8	4.4	0.9
No.....	22,214	11.5	3.8	5.0	2.4	0.3	4.3	6.8	72.5	5.0	0.6
Don't know.....	2,939	6.8	2.1	3.1	1.5	0.1	2.0	6.8	79.4	5.0	1.3
Not specified.....	3,726	0.2	0.1	-	0.1	-	0.3	0.3	10.9	88.3	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:											
1 to 25 percent.....	9,934	16.1	5.5	7.0	3.2	0.4	7.0	8.7	63.9	4.3	1.1
26 to 75 percent.....	2,499	17.0	8.8	5.0	2.2	1.0	4.9	12.3	62.1	3.6	2.3
Over 75 percent.....	1,148	11.0	3.1	7.0	.9	-	8.2	3.6	72.2	5.0	2.4
None.....	11,808	11.3	3.0	5.1	2.9	0.3	4.2	6.3	73.7	4.6	0.9
Don't know.....	13,573	9.7	3.4	4.0	1.9	0.4	4.4	7.4	73.4	5.0	0.6
Not specified.....	4,029	0.4	0.2	0.1	0.1	-	0.2	0.9	14.7	83.8	0.1

See footnotes at the end of the table.



Table 5E. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: DIGITAL REPRESENTATION OF COMPUTER-AIDED DESIGN (CAD) OUTPUT USED IN PROCUREMENT ACTIVITIES**—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (per-cent)	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			When technology was first implemented				Plan to use within				
			Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:											
None .....	13,687	8.9	2.8	3.9	1.8	0.4	2.9	5.2	77.4	5.7	0.9
Less than 10 percent .....	15,360	11.5	4.2	4.8	2.2	0.3	6.2	8.6	69.5	4.2	0.7
10 to 19 percent .....	4,737	12.6	4.3	5.6	2.4	0.3	6.3	10.5	66.5	4.2	1.0
20 to 49 percent .....	3,912	23.7	7.4	10.4	4.7	1.2	6.5	9.4	56.7	3.6	1.8
50 percent or more .....	1,398	19.4	6.5	6.3	6.6	-	6.4	7.1	63.5	3.7	2.5
Not specified .....	3,897	0.7	0.2	0.3	0.2	-	0.5	0.4	12.0	86.5	0.2
Where is most of the research and development work for the plant done:											
Outside the firm .....	1,834	4.6	2.2	1.6	.8	-	2.1	7.5	83.7	2.1	1.1
In the plant .....	25,416	13.9	4.5	5.9	3.0	0.5	6.1	7.9	67.1	5.0	0.6
Elsewhere in the firm .....	4,969	13.1	5.2	5.3	2.4	0.2	5.4	9.6	68.2	3.7	1.2
No research and development done .....	7,046	7.6	2.4	3.7	1.1	0.4	2.1	5.2	80.0	5.1	1.3
Not specified .....	3,726	0.4	0.1	0.2	0.1	-	-	0.2	10.1	89.3	0.1
Where is most of the formal training for the plant conducted:											
In the plant .....	29,449	13.2	4.5	5.5	2.8	0.4	5.3	7.9	68.6	5.0	0.6
Elsewhere in the firm .....	1,099	10.5	2.0	5.8	2.1	0.6	7.0	13.0	67.0	2.5	1.7
Outside the firm .....	3,506	13.2	4.7	5.5	2.7	0.3	7.2	8.6	67.1	3.9	1.5
No formal training for staff .....	5,251	6.1	2.0	3.0	0.9	0.2	2.1	4.2	83.2	4.4	1.1
Not specified .....	3,686	0.3	0.1	0.1	0.1	-	0.2	0.2	9.0	90.2	0.1
Who conducts most of the formal training for the staff:											
Staff from inside the plant .....	26,952	12.7	4.1	5.5	2.7	0.4	4.9	7.4	69.7	5.2	0.6
Staff from outside the plant .....	1,637	14.2	5.2	5.8	2.7	0.5	7.6	12.3	64.6	1.3	1.7
Trainers from outside the firm .....	5,287	14.4	5.8	5.4	2.9	0.3	8.3	10.7	63.4	3.1	1.3
Not specified .....	9,115	3.9	1.2	2.0	0.6	0.1	1.5	2.6	52.5	39.5	0.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:											
Not difficult .....	13,905	9.5	3.3	4.1	1.9	0.2	4.2	6.1	76.2	4.1	0.7
Some problems .....	19,836	13.5	4.4	6.1	2.4	0.6	6.0	8.7	67.1	4.7	0.7
Very difficult .....	5,401	15.1	5.1	5.2	4.6	0.2	4.5	7.9	66.7	5.9	1.6
Not specified .....	3,849	0.5	0.1	0.2	0.2	-	-	0.3	12.3	87.0	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:											
Yes .....	3,265	16.2	4.3	7.6	4.1	0.2	5.6	10.3	64.8	3.1	1.4
No .....	34,703	11.7	4.0	5.0	2.3	0.4	5.1	7.3	71.1	4.9	0.5
Don't know .....	1,447	16.1	6.1	5.3	4.4	0.3	4.6	9.1	65.1	5.2	1.9
Not specified .....	3,576	0.3	0.1	0.1	0.1	-	-	-	7.2	92.6	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 5F. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: DIGITAL REPRESENTATION OF COMPUTER-AIDED DESIGN (CAD) OUTPUT USED IN PROCUREMENT ACTIVITIES**

Establishment characteristic	Number of establishments <sup>1</sup>	Percent distribution						Absolute standard error of "Used in operations" <sup>3</sup> (percent)
		Used in operations	Single most significant reason for using the technology					
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	11.2	5.8	3.2	0.9	0.8	0.4	0.4
Major Group:								
34, Fabricated Metal Products.....	13,190	7.0	3.8	2.0	0.6	0.3	0.3	0.8
35, Industrial Machinery and Equipment.....	14,231	11.6	4.9	4.2	1.2	0.9	0.4	0.9
36, Electronic and Other Electric Equipment.....	7,472	16.1	8.8	4.3	1.0	1.5	0.5	1.0
37, Transportation Equipment.....	4,110	9.6	4.9	2.2	0.6	1.0	0.9	0.9
38, Instruments and Related Products.....	3,988	16.1	10.1	2.8	1.3	1.1	0.7	1.1
Employment size:								
20 to 99.....	30,502	8.9	4.4	2.7	0.7	0.7	0.3	0.6
100 to 499.....	10,321	14.0	7.4	4.3	0.9	0.9	0.5	0.5
500 and over.....	2,168	30.3	16.3	5.6	3.3	3.5	1.5	0.8
Age of plant (years):								
Less than 5.....	4,893	12.5	8.0	2.8	0.2	0.9	0.5	1.3
5 to 15.....	13,722	12.9	6.1	4.4	1.0	1.0	0.4	0.9
16 to 30.....	11,303	12.7	6.8	3.3	1.1	0.9	0.7	1.0
Over 30.....	9,310	10.5	5.0	3.0	1.3	0.9	0.4	0.8
Not specified.....	3,763	0.2	0.1	-	-	-	0.1	0.1
Manufacturing process:								
Fabrication/machining.....	6,795	9.3	4.9	2.7	0.8	0.4	0.5	1.2
Assembly.....	6,388	15.6	9.8	3.5	0.8	1.1	0.3	1.0
Both.....	23,393	13.0	6.1	4.0	1.2	1.1	0.5	0.7
Neither.....	2,577	4.3	2.9	1.1	0.2	0.1	-	1.2
Not specified.....	3,838	0.9	0.2	0.4	0.1	-	0.2	0.4
Market for most products:								
Consumer.....	4,358	8.4	3.2	2.8	1.0	0.9	0.5	1.2
Commercial.....	5,791	16.7	10.8	4.3	0.6	0.8	0.3	1.4
Industrial.....	18,796	11.3	5.4	3.8	0.8	0.8	0.5	0.8
Transportation.....	3,974	11.9	6.2	3.1	0.7	1.4	0.5	1.4
Government.....	2,141	19.1	10.1	2.9	4.5	1.2	0.4	2.1
Other.....	3,679	11.6	6.1	2.7	1.1	1.4	0.3	1.2
Not specified.....	4,252	1.3	0.2	0.5	0.1	-	0.5	0.4
Market price for most products:								
Less than \$5.....	5,274	7.6	3.6	2.5	0.2	1.1	0.2	1.0
\$5 to \$100.....	10,422	9.3	4.8	2.9	0.5	0.6	0.5	0.9
\$101 to \$1,000.....	8,846	11.6	6.2	3.3	0.9	0.9	0.3	1.1
\$1,001 to \$2,000.....	2,023	17.9	10.3	4.9	1.5	0.9	0.3	2.5
\$2,001 to \$10,000.....	4,265	14.3	7.0	4.1	1.6	1.1	0.6	1.4
Over \$10,000.....	7,340	17.6	9.1	4.5	1.7	1.3	0.9	1.2
Not specified.....	4,821	3.2	1.3	1.2	0.5	-	0.1	1.1
Products made to military specifications:								
Yes.....	14,112	14.6	7.5	4.2	1.2	1.2	0.5	0.9
No.....	22,214	11.4	5.9	3.3	1.0	0.8	0.5	0.6
Don't know.....	2,939	6.8	3.2	2.7	0.1	0.4	0.4	1.3
Not specified.....	3,726	0.1	0.1	-	-	-	0.1	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	16.1	9.1	4.1	1.3	1.0	0.6	1.1
26 to 75 percent.....	2,499	17.1	7.6	4.1	3.5	1.4	0.4	2.3

See footnotes at end of table.

Table 5F. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: DIGITAL REPRESENTATION OF COMPUTER-AIDED DESIGN (CAD) OUTPUT USED IN PROCUREMENT ACTIVITIES—Continued**

Establishment characteristic	Number of establishments <sup>1</sup>	Percent distribution						Absolute standard error of "Used in operations" (percent) <sup>3</sup>
		Used in operations	Single most significant reason for using the technology					
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:—Cont.								
Over 75 percent .....	1,148	11.0	4.1	4.9	1.1	0.3	0.6	2.4
None .....	11,808	11.2	4.7	4.1	0.9	1.1	0.4	0.9
Don't know .....	13,573	9.7	5.6	2.5	0.4	0.7	0.5	0.6
Not specified .....	4,029	0.4	0.3	0.1	-	-	-	0.1
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	8.9	4.8	2.6	0.4	0.8	0.2	0.9
Less than 10 percent .....	15,360	11.6	5.1	3.6	1.5	0.9	0.4	0.7
10 to 19 percent .....	4,737	12.6	6.8	3.8	0.4	1.1	0.5	1.0
20 to 49 percent .....	3,912	23.7	14.2	5.3	1.4	1.2	1.6	1.8
50 percent or more .....	1,398	19.3	9.3	6.3	2.4	0.7	0.6	2.5
Not specified .....	3,897	0.7	0.5	0.2	-	0.1	0.1	0.2
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	4.6	3.3	0.2	0.3	-	0.8	1.1
In this plant .....	25,416	13.9	7.0	4.3	1.0	1.0	0.6	0.6
Elsewhere in the firm .....	4,969	13.1	7.1	2.4	1.2	1.8	0.5	1.2
No research and development done ..	7,046	7.5	3.9	2.3	0.9	0.4	0.1	1.3
Not specified .....	3,726	0.4	0.1	0.2	-	-	0.1	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	13.2	6.9	3.8	1.1	0.9	0.5	0.6
Elsewhere in the firm .....	1,099	10.6	3.0	3.9	0.9	1.9	0.8	1.7
Outside the firm .....	3,506	13.2	7.9	2.9	0.5	1.6	0.4	1.5
No formal training for staff conducted .....	5,251	6.2	2.5	2.2	0.7	0.5	0.2	1.1
Not specified .....	3,686	0.3	0.1	0.1	-	-	0.2	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	12.8	6.5	3.8	1.1	0.9	0.5	0.6
Staff from outside the plant .....	1,637	14.2	6.1	4.2	1.8	1.5	0.5	1.7
Trainers from outside the firm .....	5,287	14.5	9.0	3.5	0.5	1.1	0.3	1.3
Not specified .....	9,115	3.9	1.6	1.3	0.4	0.3	0.3	0.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	9.5	4.9	2.6	0.7	0.9	0.3	0.7
Some problems .....	19,836	13.4	7.1	3.8	1.2	0.7	0.6	0.7
Very difficult .....	5,401	15.0	6.8	5.1	1.0	1.7	0.5	1.6
Not specified .....	3,849	0.4	0.2	0.1	-	-	0.2	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	16.2	7.5	4.9	1.7	1.4	0.8	1.4
No .....	34,703	11.7	5.9	3.4	1.0	0.9	0.5	0.5
Don't know .....	1,447	16.1	11.7	2.5	0.6	0.9	0.4	1.9
Not specified .....	3,576	0.2	0.1	-	-	-	0.1	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major group, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 6A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: FLEXIBLE MANUFACTURING CELLS (FMC) OR SYSTEMS (FMS)

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented:				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	12.6	-	3.8	4.6	3.8	0.4	4.0	5.5	66.8	11.1	0.4
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	9.6	-	2.8	3.4	3.1	0.3	4.2	5.4	68.9	12.0	0.7
35, Industrial Machinery and Equipment . . . . .	14,231	11.8	-	3.2	4.6	3.6	0.4	3.8	5.2	69.2	10.1	0.8
36, Electronic and Other Electric Equipment. . . . .	7,472	17.0	-	5.6	6.0	4.9	0.5	4.0	4.9	62.5	11.7	0.9
37, Transportation Equipment . . . . .	4,110	15.5	-	5.4	5.0	4.8	0.3	4.5	7.1	61.4	11.6	1.1
38, Instruments and Related Products. . . . .	3,988	14.3	-	4.7	5.5	3.7	0.4	4.2	6.3	64.8	10.4	1.0
Employment size:												
20 to 99. . . . .	30,502	7.6	-	2.3	2.9	2.2	0.2	3.0	4.7	72.6	12.1	0.5
100 to 499. . . . .	10,321	21.4	-	7.6	7.5	5.7	0.6	6.7	7.8	55.6	8.6	0.7
500 and over. . . . .	2,168	40.2	-	7.8	14.3	16.9	1.2	6.6	6.1	38.0	9.1	0.8
Age of plant (years):												
Less than 5. . . . .	4,893	13.3	-	5.7	4.9	2.5	0.2	4.1	6.3	71.5	4.7	1.3
5 to 15. . . . .	13,722	13.4	-	3.8	5.2	3.8	0.6	4.5	5.7	72.9	3.7	0.8
16 to 30. . . . .	11,303	13.4	-	4.4	4.5	4.1	0.4	4.6	5.6	72.8	3.6	0.9
Over 30. . . . .	9,310	15.1	-	3.7	5.5	5.6	0.3	4.1	6.5	70.6	3.6	0.8
Not specified. . . . .	3,763	-	-	-	-	-	-	0.5	0.7	10.9	87.9	0.1
Manufacturing process:												
Fabrication/machining. . . . .	6,795	8.2	-	2.0	3.4	2.3	0.5	3.0	5.2	80.0	3.6	0.8
Assembly. . . . .	6,388	15.7	-	5.4	5.8	4.0	0.5	3.9	4.3	73.3	2.7	1.0
Both. . . . .	23,393	15.9	-	4.9	5.7	5.0	0.3	5.2	7.2	68.3	3.5	0.6
Neither. . . . .	2,577	4.9	-	0.9	1.4	1.8	0.8	1.4	1.6	84.0	8.1	1.3
Not specified. . . . .	3,838	0.3	-	-	0.2	0.1	-	0.8	-	11.9	87.0	0.1
Market for most products:												
Consumer. . . . .	4,358	12.6	-	2.8	5.1	4.3	0.4	4.2	7.7	70.5	5.0	1.0
Commercial. . . . .	5,791	17.1	-	5.8	6.7	4.4	0.2	5.5	5.5	69.1	2.7	1.3
Industrial. . . . .	18,796	11.7	-	3.4	4.1	3.7	0.5	3.9	5.9	74.6	3.9	0.7
Transportation. . . . .	3,974	20.7	-	6.4	7.1	7.0	0.2	5.1	7.0	63.8	3.4	1.6
Government. . . . .	2,141	16.3	-	3.8	6.2	6.2	0.1	4.1	6.2	69.7	3.7	2.1
Other. . . . .	3,679	11.2	-	5.1	3.4	1.9	0.8	5.1	4.2	75.4	4.1	1.2
Not specified. . . . .	4,252	2.0	-	0.4	1.2	0.3	0.1	0.8	0.5	18.8	77.8	0.7
Market price for most products:												
Less than \$5. . . . .	5,274	15.8	-	4.6	5.9	4.8	0.5	4.3	6.0	70.2	3.8	1.2
\$5 to \$100. . . . .	10,422	15.6	-	5.5	5.8	3.8	0.5	5.2	7.0	68.3	3.8	1.0
\$101 to \$1,000. . . . .	8,846	13.6	-	4.0	5.4	4.0	0.2	4.3	6.8	72.4	3.0	1.1
\$1,001 to \$2,000. . . . .	2,023	13.4	-	3.3	5.0	4.7	0.4	4.3	5.4	73.6	3.3	2.1
\$2,001 to \$10,000. . . . .	4,265	11.6	-	3.5	3.6	3.7	0.8	5.2	5.2	75.0	3.1	1.2
Over \$10,000. . . . .	7,340	11.8	-	3.3	3.6	4.7	0.2	3.2	4.6	76.7	3.7	0.9
Not specified. . . . .	4,821	2.2	-	0.3	1.2	0.5	0.2	1.0	0.9	24.3	71.6	0.6
Products made to military specifications:												
Yes. . . . .	14,112	17.0	-	4.7	6.4	5.5	0.4	5.3	7.7	66.9	3.1	0.9
No. . . . .	22,214	12.0	-	3.8	4.3	3.5	0.4	4.0	5.0	74.8	4.1	0.5
Don't know. . . . .	2,939	11.0	-	4.1	4.1	2.3	0.5	3.4	5.0	76.2	4.3	1.7
Not specified. . . . .	3,726	0.1	-	-	-	0.1	-	0.1	0.1	11.0	88.7	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent. . . . .	9,934	17.1	-	5.2	6.7	4.9	0.3	5.9	7.6	66.8	2.7	1.1
26 to 75 percent. . . . .	2,499	15.8	-	3.6	6.0	5.0	1.2	3.1	8.2	70.4	2.4	2.1
Over 75 percent. . . . .	1,148	16.0	-	4.4	6.2	5.2	0.2	5.1	3.8	66.9	8.2	3.3
None. . . . .	11,808	11.7	-	3.3	4.4	3.6	0.4	3.1	5.1	76.3	3.8	0.7
Don't know. . . . .	13,573	12.8	-	4.3	4.2	3.9	0.4	4.7	5.4	73.3	3.8	0.7
Not specified. . . . .	4,029	0.3	-	0.2	0.1	-	-	0.2	0.5	14.7	84.2	0.1

See footnotes at the end of the table.

Table 6A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: FLEXIBLE MANUFACTURING CELLS (FMC) OR SYSTEMS (FMS)**—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented:				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	8.6	-	2.5	3.0	2.9	0.2	3.5	4.3	79.2	4.3	0.8
Less than 10 percent .....	15,360	15.9	-	5.3	5.4	4.8	0.4	5.4	7.0	68.3	3.4	0.8
10 to 19 percent .....	4,737	17.4	-	5.7	7.4	4.0	0.3	4.6	7.1	68.3	2.6	1.3
20 to 49 percent .....	3,912	16.8	-	4.2	6.3	5.6	0.7	3.9	7.6	68.3	3.4	1.2
50 percent or more .....	1,398	16.3	-	3.6	7.2	4.6	0.9	3.1	3.6	73.6	3.4	1.9
Not specified .....	3,897	1.6	-	0.3	0.9	0.4	-	0.4	0.3	11.2	86.5	0.6
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	9.8	-	2.5	4.3	2.7	0.3	1.0	3.5	82.7	2.9	1.9
In the plant .....	25,416	14.3	-	4.8	5.2	4.0	0.3	4.9	6.7	70.1	4.0	0.6
Elsewhere in the firm .....	4,969	23.6	-	6.0	8.5	8.3	0.8	6.9	6.5	60.2	2.8	1.3
No research and development done .....	7,046	5.7	-	1.3	2.1	1.9	0.4	1.9	3.7	85.7	3.1	1.0
Not specified .....	3,726	0.4	-	-	0.2	0.2	-	-	-	9.5	90.1	0.2
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	14.6	-	4.4	5.3	4.4	0.5	4.2	6.3	71.0	4.0	0.6
Elsewhere in the firm .....	1,099	28.0	-	8.3	8.7	9.6	1.4	10.4	4.9	54.7	2.0	3.1
Outside the firm .....	3,506	16.4	-	5.7	6.2	4.4	0.1	6.1	7.0	67.0	3.4	1.5
No formal training for staff .....	5,251	4.3	-	1.1	2.1	1.1	-	3.2	3.7	86.1	2.8	0.8
Not specified .....	3,686	0.4	-	0.1	-	0.3	-	0.2	-	9.3	90.2	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	13.2	-	3.8	4.9	4.1	0.4	4.0	5.9	72.8	4.0	0.6
Staff from outside the plant .....	1,637	26.4	-	8.4	9.2	8.1	0.7	8.0	7.1	56.0	2.5	2.3
Trainers from outside the firm .....	5,287	20.3	-	7.6	6.6	5.7	0.4	7.1	8.2	61.9	2.5	1.4
Not specified .....	9,115	3.7	-	0.8	1.9	0.8	0.2	1.7	2.3	53.7	38.7	0.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	12.0	-	3.5	4.4	3.8	0.3	3.1	4.7	76.2	4.0	0.8
Some problems .....	19,836	14.5	-	4.6	5.4	3.9	0.6	5.3	6.8	70.4	3.0	0.6
Very difficult .....	5,401	15.8	-	4.6	5.1	5.9	0.2	4.4	6.4	68.2	5.1	1.6
Not specified .....	3,849	0.3	-	-	0.2	0.1	-	0.1	0.3	11.8	87.4	0.2
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	22.3	-	6.5	8.6	6.3	0.9	5.3	4.5	65.1	2.9	1.5
No .....	34,703	12.6	-	3.9	4.6	3.7	0.4	4.3	6.1	73.3	3.8	0.5
Don't know .....	1,447	23.1	-	6.2	8.1	8.3	0.5	5.6	6.1	61.8	3.5	2.1
Not specified .....	3,576	0.2	-	-	-	0.2	-	-	-	7.0	92.8	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 6B. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: FLEXIBLE MANUFACTURING CELLS (FMC) OR SYSTEMS (FMS)**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	12.6	3.5	5.0	2.5	0.8	0.8	0.4
Major Group:								
34, Fabricated Metal Products.....	13,190	9.5	2.4	4.4	1.9	0.3	0.5	0.7
35, Industrial Machinery and Equipment.....	14,231	11.8	3.0	5.3	1.9	0.8	.8	0.8
36, Electronic and Other Electric Equipment.....	7,472	17.0	5.6	5.4	3.3	1.6	1.1	0.9
37, Transportation Equipment.....	4,110	15.5	3.8	6.3	3.4	1.4	0.6	1.1
38, Instruments and Related Products.....	3,988	14.2	4.4	4.5	3.6	0.5	1.1	1.0
Employment size:								
20 to 99.....	30,502	7.6	2.0	3.2	1.4	0.5	0.5	0.5
100 to 499.....	10,321	21.3	6.1	8.6	4.0	1.2	1.5	0.7
500 and over.....	2,168	40.1	12.2	13.7	9.5	3.3	1.8	0.8
Age of plant (years):								
Less than 5.....	4,893	13.4	4.6	4.8	2.1	1.1	0.8	1.3
5 to 15.....	13,722	13.3	3.8	5.4	2.2	0.9	1.1	0.8
16 to 30.....	11,303	13.4	3.0	5.9	3.2	0.8	0.5	0.9
Over 30.....	9,310	15.2	4.4	5.8	3.1	0.9	1.0	0.8
Not specified.....	3,763	-	-	-	-	-	-	0.1
Manufacturing process:								
Fabrication/machining.....	6,795	8.2	1.7	3.4	2.2	0.3	0.6	0.8
Assembly.....	6,388	15.8	5.4	5.1	2.9	1.3	1.1	1.0
Both.....	23,393	15.9	4.3	6.7	2.9	1.1	0.8	0.6
Neither.....	2,577	4.9	0.8	1.9	1.3	0.1	0.9	1.3
Not specified.....	3,838	0.2	-	-	0.1	-	0.1	0.1
Market for most products:								
Consumer.....	4,358	12.6	2.6	4.0	3.5	1.4	1.1	1.0
Commercial.....	5,791	17.1	5.6	7.5	1.9	1.1	1.0	1.3
Industrial.....	18,796	11.7	3.0	5.2	2.3	0.7	0.5	0.7
Transportation.....	3,974	20.7	6.1	8.4	4.1	1.2	0.9	1.6
Government.....	2,141	16.3	5.3	4.5	5.6	0.7	0.2	2.1
Other.....	3,679	11.2	3.2	4.0	2.1	0.9	0.9	1.2
Not specified.....	4,252	2.0	0.2	0.3	0.1	-	1.4	0.7
Market price for most products:								
Less than \$5.....	5,274	15.7	3.4	6.9	3.6	0.7	1.1	1.2
\$5 to \$100.....	10,422	15.7	4.6	5.9	3.0	0.9	1.3	1.0
\$101 to \$1,000.....	8,846	13.6	4.7	4.8	2.8	0.8	0.4	1.1
\$1,001 to \$2,000.....	2,023	13.3	2.2	6.7	2.1	1.5	0.9	2.1
\$2,001 to \$10,000.....	4,265	11.7	3.4	5.1	1.2	1.0	0.9	1.2
Over \$10,000.....	7,340	11.8	2.8	5.1	2.7	0.9	0.4	0.9
Not specified.....	4,821	2.2	0.7	0.8	0.2	0.2	0.3	0.6
Products made to military specifications:								
Yes.....	14,112	17.0	4.8	7.1	3.3	0.9	0.9	0.9
No.....	22,214	12.1	3.2	4.7	2.5	0.9	0.8	0.5
Don't know.....	2,939	11.1	4.0	4.3	1.4	0.4	1.0	1.7
Not specified.....	3,726	0.1	-	-	0.1	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	17.0	4.8	7.5	3.1	0.7	0.8	1.1
26 to 75 percent.....	2,499	15.8	4.3	6.1	4.2	0.9	0.4	2.1
Over 75 percent.....	1,148	15.9	7.7	3.0	3.8	0.9	0.4	3.3
None.....	11,808	11.7	2.9	4.8	2.3	1.1	0.7	0.7
Don't know.....	13,573	12.9	3.5	4.9	2.4	0.8	1.2	0.7
Not specified.....	4,029	0.3	-	0.1	-	-	0.1	0.1

See footnotes at the end of the table.



Table 6B. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: FLEXIBLE MANUFACTURING CELLS (FMC) OR SYSTEMS (FMS)—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	8.7	2.4	3.4	1.7	0.5	0.6	0.8
Less than 10 percent .....	15,360	15.9	4.3	6.3	3.4	1.0	0.9	0.8
10 to 19 percent .....	4,737	17.5	4.5	7.0	3.6	1.1	1.4	1.3
20 to 49 percent .....	3,912	16.8	5.3	6.3	2.8	1.4	1.0	1.2
50 percent or more .....	1,398	16.3	5.2	8.2	1.7	0.4	0.8	1.9
Not specified .....	3,897	1.7	0.4	0.9	0.1	0.2	0.1	0.6
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	9.9	1.1	4.2	3.9	-	0.7	1.9
In this plant .....	25,416	14.3	4.2	5.8	2.7	0.9	0.7	0.6
Elsewhere in the firm .....	4,969	23.6	6.6	8.3	4.8	1.9	2.1	1.3
No research and development done ..	7,046	5.7	1.0	3.1	0.8	0.3	0.4	1.0
Not specified .....	3,726	0.4	0.1	0.1	-	-	0.2	0.2
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	14.6	4.0	5.8	2.8	1.1	0.9	0.6
Elsewhere in the firm .....	1,099	28.0	9.3	10.5	6.3	0.6	1.4	3.1
Outside the firm .....	3,506	16.4	3.9	7.8	3.5	0.5	0.7	1.5
No formal training for staff conducted ..	5,251	4.3	1.2	1.5	0.9	0.2	0.4	0.8
Not specified .....	3,686	0.4	0.1	0.1	0.1	-	0.1	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	13.3	3.9	5.2	2.5	1.0	0.7	0.6
Staff from outside the plant .....	1,637	26.4	5.9	11.1	6.1	1.5	1.8	2.3
Trainers from outside the firm .....	5,287	20.2	5.1	9.2	4.3	0.8	0.9	1.4
Not specified .....	9,115	3.6	0.9	1.0	0.7	0.2	0.8	0.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	12.0	3.8	4.8	1.9	0.7	0.8	0.8
Some problems .....	19,836	14.5	3.8	5.9	3.2	0.9	0.8	0.6
Very difficult .....	5,401	15.8	4.0	6.2	3.0	1.3	1.3	1.6
Not specified .....	3,849	0.3	0.1	-	0.2	-	-	0.2
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	22.3	7.7	6.7	4.5	1.2	2.1	1.5
No .....	34,703	12.5	3.3	5.2	2.4	0.8	0.7	0.5
Don't know .....	1,447	23.0	5.5	9.3	4.9	1.5	1.7	2.1
Not specified .....	3,576	0.3	0.1	0.1	-	-	0.1	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 6C. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: NUMERICALLY CONTROLLED (NC)/COMPUTER NUMERICALLY CONTROLLED (CNC) MACHINES**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	46.3	171,772	4.3	11.6	29.2	1.2	2.4	3.7	37.8	9.8	0.7
Major Group:												
34, Fabricated Metal Products.	13,190	40.4	28,926	4.2	11.1	23.9	1.2	2.5	5.3	41.0	10.8	1.5
35, Industrial Machinery and Equipment . . . . .	14,231	61.8	90,726	4.6	14.3	41.6	1.3	2.1	2.4	25.3	8.4	1.3
36, Electronic and Other Electric Equipment. . . . .	7,472	34.5	19,684	3.4	8.5	21.4	1.2	2.4	3.2	49.1	10.8	1.3
37, Transportation Equipment .	4,110	44.1	21,966	4.7	11.7	26.1	1.6	2.9	3.2	40.0	9.8	1.5
38, Instruments and Related Products. . . . .	3,988	35.1	10,469	5.0	8.9	20.3	0.9	2.3	4.2	48.8	9.6	1.5
Employment size:												
20 to 99 . . . . .	30,502	41.4	81,323	4.2	10.9	25.2	1.1	2.4	3.9	41.5	10.8	0.9
100 to 499 . . . . .	10,321	56.6	53,341	4.8	13.4	36.9	1.5	2.1	3.5	30.6	7.3	0.8
500 and over . . . . .	2,168	67.0	37,108	4.3	12.6	48.2	1.9	2.3	1.3	21.0	8.2	0.8
Age of plant (years):												
Less than 5 . . . . .	4,893	38.4	10,791	6.2	15.8	15.7	0.7	3.8	3.9	51.3	2.6	2.2
5 to 15 . . . . .	13,722	47.9	46,258	4.2	11.9	30.5	1.3	2.5	4.1	42.9	2.7	1.4
16 to 30 . . . . .	11,303	53.7	60,953	5.4	13.1	33.6	1.6	2.9	3.7	37.4	2.3	1.5
Over 30 . . . . .	9,310	57.3	53,320	3.9	11.7	40.6	1.1	1.5	4.4	34.9	1.9	1.5
Not specified . . . . .	3,763	1.6	450	-	0.2	0.6	0.8	0.5	-	10.3	87.7	0.8
Manufacturing process:												
Fabrication/machining . . . . .	6,795	57.1	45,315	5.0	14.8	35.3	2.0	3.4	3.6	34.1	1.8	2.2
Assembly . . . . .	6,388	14.6	5,285	2.8	4.9	6.4	0.5	1.9	3.2	77.6	2.6	1.0
Both. . . . .	23,393	62.7	119,511	5.5	15.3	40.4	1.5	2.7	4.4	28.4	1.8	1.0
Neither . . . . .	2,577	12.7	1,367	2.2	1.9	8.5	0.1	0.7	3.1	75.5	8.0	2.3
Not specified . . . . .	3,838	2.7	293	-	1.0	1.7	-	0.3	0.2	10.3	86.5	0.8
Market for most products:												
Consumer . . . . .	4,358	33.9	8,994	5.3	11.2	17.0	0.4	2.6	6.0	52.8	4.7	2.0
Commercial . . . . .	5,791	44.4	19,651	4.3	11.9	27.3	0.9	1.9	4.6	47.4	1.7	2.0
Industrial . . . . .	18,796	55.6	90,324	4.4	12.8	36.9	1.5	2.8	3.2	36.4	2.0	1.2
Transportation . . . . .	3,974	54.8	25,838	4.7	16.4	31.8	1.9	2.4	5.6	35.2	1.9	2.2
Government. . . . .	2,141	62.8	11,620	7.2	13.2	41.4	1.0	1.5	3.4	31.1	1.1	2.8
Other . . . . .	3,679	42.2	12,811	4.5	11.7	25.2	0.8	3.2	3.6	47.9	3.0	2.4
Not specified . . . . .	4,252	7.8	2,533	1.1	0.7	5.0	1.0	0.6	0.4	12.8	78.3	1.3
Market price for most products:												
Less than \$5 . . . . .	5,274	39.5	11,994	5.3	14.2	19.2	0.8	3.4	5.3	48.8	3.1	2.0
\$5 to \$100 . . . . .	10,422	51.1	46,083	4.7	13.1	31.4	1.9	2.8	4.4	39.5	2.2	1.6
\$101 to \$1,000 . . . . .	8,846	54.6	53,908	5.4	12.3	35.5	1.4	2.0	3.7	38.1	1.6	1.7
\$1,001 to \$2,000 . . . . .	2,023	43.7	7,164	2.6	12.6	27.2	1.3	3.2	6.8	45.0	1.4	3.4
\$2,001 to \$10,000 . . . . .	4,265	54.9	16,045	5.9	14.1	34.2	0.7	1.5	2.9	38.9	1.9	2.3
Over \$10,000. . . . .	7,340	54.2	33,211	3.7	10.7	38.7	1.1	2.6	2.8	38.3	2.0	1.6
Not specified . . . . .	4,821	10.0	3,366	0.8	2.7	5.6	0.9	0.9	0.9	17.1	71.2	1.5
Products made to military specifications:												
Yes . . . . .	14,112	62.4	86,360	4.9	13.5	41.8	2.2	2.0	4.4	29.9	1.4	1.2
No . . . . .	22,214	44.3	76,597	4.9	12.1	26.3	1.0	3.0	3.9	46.0	2.8	1.0
Don't know . . . . .	2,939	42.5	8,748	2.6	12.7	27.0	0.2	2.4	2.7	49.0	3.5	3.0
Not specified . . . . .	3,726	0.6	65	-	0.3	0.3	-	0.2	0.2	10.5	88.5	0.3
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	61.2	55,776	5.3	13.6	40.7	1.6	2.6	4.0	31.2	1.1	1.5
26 to 75 percent . . . . .	2,499	65.9	13,849	6.6	11.8	43.4	4.1	4.4	4.2	25.2	0.2	3.0
Over 75 percent. . . . .	1,148	64.8	4,751	7.0	15.0	41.8	1.0	1.0	2.0	30.5	1.6	4.7
None . . . . .	11,808	42.3	49,309	5.0	12.0	24.5	0.8	2.4	4.4	47.7	3.2	1.4
Don't know . . . . .	13,573	46.6	46,740	3.7	12.6	29.1	1.2	2.4	3.8	44.4	2.7	1.3
Not specified . . . . .	4,029	3.4	1,347	-	1.0	2.3	0.1	0.3	0.2	12.9	83.1	0.9

See footnotes at the end of the table.

Table 6C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: NUMERICALLY CONTROLLED (NC)/COMPUTER NUMERICALLY CONTROLLED (CNC) MACHINES—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	48.7	60,781	4.5	11.6	31.2	1.4	1.9	3.3	43.4	2.9	1.5
Less than 10 percent .....	15,360	50.7	59,478	4.8	13.6	31.2	1.1	3.2	4.9	39.1	2.1	1.2
10 to 19 percent .....	4,737	54.3	23,562	5.0	12.8	34.7	1.8	2.6	4.0	38.0	1.1	1.9
20 to 49 percent .....	3,912	54.5	18,903	5.1	13.5	34.6	1.3	2.4	4.0	37.3	1.7	2.0
50 percent or more .....	1,398	45.3	7,881	5.1	8.6	29.7	1.9	2.8	2.0	47.8	2.1	3.3
Not specified .....	3,897	3.6	1,166	-	1.3	2.2	0.1	0.4	-	9.8	86.2	0.7
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	43.9	4,461	5.2	10.3	25.3	3.1	0.9	6.1	47.7	1.3	3.9
In the plant .....	25,416	52.2	101,126	5.6	13.0	32.2	1.4	2.8	4.5	38.2	2.3	0.9
Elsewhere in the firm .....	4,969	48.0	26,844	4.2	13.8	28.7	1.3	3.9	3.0	42.7	2.5	1.8
No research and development done .....	7,046	48.6	39,042	1.9	11.1	34.7	0.9	1.4	1.9	46.0	2.2	2.3
Not specified .....	3,726	1.2	296	-	0.6	0.6	-	-	1.0	8.4	89.4	0.4
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	50.0	119,377	4.8	12.6	31.3	1.3	2.6	4.3	40.5	2.6	0.9
Elsewhere in the firm .....	1,099	52.2	7,625	3.8	11.6	34.7	2.1	4.9	2.6	38.7	1.5	4.1
Outside the firm .....	3,506	63.4	14,985	8.2	14.0	39.3	1.9	2.8	2.7	30.3	1.0	2.4
No formal training for staff. ...	5,251	44.4	29,489	2.1	12.0	29.3	1.0	1.5	3.4	48.8	2.0	2.4
Not specified .....	3,686	1.8	295	0.1	0.4	1.2	0.1	0.2	0.1	8.0	90.0	0.4
Who conducts most of the formal training for the staff:												
Staff from inside the plant . . . .	26,952	48.7	102,015	4.6	12.4	30.4	1.3	2.5	4.3	41.8	2.7	0.9
Staff from outside the plant . . .	1,637	53.6	10,599	4.9	13.4	34.4	0.9	3.6	3.8	38.1	0.9	3.2
Trainers from outside the firm .	5,287	64.2	28,275	7.4	14.3	40.7	1.8	3.7	3.0	28.3	0.8	1.8
Not specified .....	9,115	27.4	30,882	1.5	7.2	18.0	0.7	1.0	2.2	31.5	37.8	1.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	37.9	37,187	3.2	9.9	23.9	0.9	2.1	3.3	54.1	2.6	1.3
Some problems .....	19,836	55.6	105,762	5.6	13.8	34.3	1.9	2.6	4.6	35.3	1.8	1.0
Very difficult. ....	5,401	65.2	28,101	5.4	15.6	43.5	0.7	3.7	3.7	24.2	3.2	2.0
Not specified .....	3,849	2.3	721	0.2	0.4	1.7	-	-	-	11.1	86.6	0.6
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	54.4	18,461	5.3	15.7	32.2	1.2	2.9	4.0	36.6	2.1	2.0
No .....	34,703	50.1	144,992	4.6	12.3	31.8	1.4	2.5	4.0	41.1	2.3	0.8
Don't know .....	1,447	49.5	8,104	5.1	11.6	31.6	1.2	3.2	4.2	41.3	1.8	3.2
Not specified .....	3,576	1.1	213	0.1	0.6	0.4	-	-	-	6.3	92.6	0.4

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 6D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: NUMERICALLY CONTROLLED (NC)/COMPUTER NUMERICALLY CONTROLLED (CNC) MACHINES**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	46.3	16.0	19.9	6.0	1.5	2.9	0.7
Major Group:								
34, Fabricated Metal Products.....	13,190	40.4	14.5	16.6	4.8	1.6	2.8	1.5
35, Industrial Machinery and Equipment.....	14,231	61.9	19.7	29.3	8.2	1.5	3.1	1.3
36, Electronic and Other Electric Equipment.....	7,472	34.5	12.8	13.2	4.7	1.3	2.5	1.3
37, Transportation Equipment.....	4,110	44.1	16.3	16.7	5.7	1.9	3.5	1.5
38, Instruments and Related Products.....	3,988	35.1	13.1	12.9	5.0	1.3	2.7	1.5
Employment size:								
20 to 99.....	30,502	41.4	13.6	18.7	5.0	1.4	2.7	0.9
100 to 499.....	10,321	56.2	20.7	22.6	7.4	1.9	3.5	0.8
500 and over.....	2,168	67.1	26.3	22.7	12.9	2.4	3.2	0.8
Age of plant (years):								
Less than 5.....	4,893	38.4	14.2	17.6	3.6	0.9	2.1	2.2
5 to 15.....	13,722	47.9	16.2	21.2	5.9	2.1	2.4	1.4
16 to 30.....	11,303	53.7	17.9	22.8	7.6	1.7	3.8	1.5
Over 30.....	9,310	57.3	20.7	23.5	7.9	1.4	3.8	1.5
Not specified.....	3,763	1.6	-	0.6	-	-	1.0	0.8
Manufacturing process:								
Fabrication/machining.....	6,795	57.1	20.3	25.2	6.2	0.9	4.5	2.2
Assembly.....	6,388	14.7	5.5	5.0	2.8	0.6	0.8	1.0
Both.....	23,393	62.7	21.5	27.1	8.3	2.4	3.4	1.0
Neither.....	2,577	12.8	3.5	5.6	1.6	0.2	1.9	2.3
Not specified.....	3,838	2.8	0.8	0.8	-	-	1.2	0.8
Market for most products:								
Consumer.....	4,358	33.9	13.4	11.6	5.1	1.7	2.1	2.0
Commercial.....	5,791	44.4	17.6	17.3	5.8	1.9	1.8	2.0
Industrial.....	18,796	55.6	18.0	26.1	7.0	1.5	2.9	1.2
Transportation.....	3,974	54.9	19.6	21.3	5.7	2.3	6.0	2.2
Government.....	2,141	62.9	18.7	26.7	13.1	1.4	2.9	2.8
Other.....	3,679	42.2	16.2	17.3	4.3	1.9	2.5	2.4
Not specified.....	4,252	7.9	2.5	1.8	0.8	0.2	2.5	1.3
Market price for most products:								
Less than \$5.....	5,274	39.4	17.9	12.6	4.1	2.2	2.6	2.0
\$5 to \$100.....	10,422	51.1	17.7	21.6	6.3	1.6	4.0	1.6
\$101 to \$1,000.....	8,846	54.6	19.6	22.4	7.3	1.5	3.8	1.7
\$1,001 to \$2,000.....	2,023	43.6	11.7	19.7	6.2	2.9	3.2	3.4
\$2,001 to \$10,000.....	4,265	54.9	17.4	27.8	7.6	0.6	1.4	2.3
Over \$10,000.....	7,340	54.2	16.2	25.6	8.0	1.9	2.5	1.6
Not specified.....	4,821	10.0	3.7	4.0	0.6	0.6	1.1	1.5
Products made to military specifications:								
Yes.....	14,112	62.4	21.0	26.8	8.5	2.2	3.9	1.2
No.....	22,214	44.3	15.5	19.2	5.4	1.4	2.8	1.0
Don't know.....	2,939	42.5	15.7	17.1	5.6	2.0	2.0	3.0
Not specified.....	3,726	0.6	-	0.3	-	-	0.3	0.3
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	61.1	20.9	26.1	8.2	1.6	4.2	1.5
26 to 75 percent.....	2,499	66.0	19.3	30.1	10.6	2.2	3.8	3.0
Over 75 percent.....	1,148	64.9	25.8	30.0	3.6	3.1	2.4	4.7
None.....	11,808	42.3	14.3	18.1	5.7	1.8	2.4	1.4
Don't know.....	13,573	46.6	17.0	19.5	5.7	1.6	2.9	1.3
Not specified.....	4,029	3.4	0.4	2.0	0.2	-	0.8	0.9

See footnotes at the end of the table.

Table 6D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: NUMERICALLY CONTROLLED (NC)/COMPUTER NUMERICALLY CONTROLLED (CNC) MACHINES—Continued**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	48.6	16.8	20.5	6.7	1.4	3.2	1.5
Less than 10 percent .....	15,360	50.7	17.1	22.9	6.2	1.7	2.8	1.2
10 to 19 percent .....	4,737	54.4	19.0	21.3	7.7	2.3	4.0	1.9
20 to 49 percent .....	3,912	54.5	17.9	23.5	7.1	2.2	3.9	2.0
50 percent or more .....	1,398	45.3	21.0	17.7	3.5	1.1	1.9	3.3
Not specified .....	3,897	3.5	1.4	1.4	0.3	0.2	0.3	0.7
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	44.0	13.3	15.9	8.6	0.7	5.5	3.9
In this plant .....	25,416	52.2	17.9	22.7	6.7	1.8	3.0	0.9
Elsewhere in the firm .....	4,969	47.9	19.9	17.8	6.0	1.5	2.6	1.8
No research and development done ..	7,046	48.6	15.3	22.6	5.7	1.5	3.5	2.3
Not specified .....	3,726	1.2	0.2	0.3	0.2	-	0.5	0.4
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	50.0	17.8	21.4	6.3	1.8	2.9	0.9
Elsewhere in the firm .....	1,099	52.2	16.0	23.6	10.1	0.5	2.1	4.1
Outside the firm .....	3,506	63.3	20.7	28.1	8.5	1.8	4.1	2.4
No formal training for staff conducted ..	5,251	44.3	13.6	19.2	6.0	1.5	4.1	2.4
Not specified .....	3,686	1.7	0.5	0.3	0.3	-	0.6	0.4
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	48.8	17.2	21.3	6.1	1.5	2.6	0.9
Staff from outside the plant .....	1,637	53.5	17.6	22.0	8.4	2.6	2.8	3.2
Trainers from outside the firm .....	5,287	64.2	23.0	25.6	9.1	2.2	4.2	1.8
Not specified .....	9,115	27.5	7.8	12.1	3.5	1.0	3.1	1.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	38.0	13.2	16.0	5.4	1.6	1.7	1.3
Some problems .....	19,836	55.6	18.3	24.9	7.0	1.5	3.9	1.0
Very difficult .....	5,401	65.2	25.6	25.5	7.8	2.2	4.1	2.0
Not specified .....	3,849	2.3	0.6	0.5	0.3	0.4	0.5	0.6
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	54.3	20.0	19.5	8.3	2.9	3.6	2.0
No .....	34,703	50.1	17.0	22.1	6.3	1.6	3.1	0.8
Don't know .....	1,447	49.4	20.0	17.3	7.3	0.8	4.0	3.2
Not specified .....	3,576	1.1	0.4	0.3	-	-	0.3	0.4

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 6E. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: MATERIALS WORKING LASERS

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	5.0	7,846	1.5	1.3	2.0	0.2	2.2	4.8	77.0	11.1	0.3
Major Group:												
34, Fabricated Metal Products.	13,190	3.4	711	1.1	0.8	1.3	0.2	1.9	6.1	76.5	12.1	0.5
35, Industrial Machinery and Equipment . . . . .	14,231	4.3	1,429	1.5	1.1	1.5	0.2	2.4	4.8	78.3	10.3	0.5
36, Electronic and Other Electric Equipment . . . . .	7,472	7.9	4,341	2.1	2.0	3.5	0.3	1.7	3.1	75.8	11.5	0.7
37, Transportation Equipment .	4,110	5.3	833	1.6	1.6	2.0	0.1	3.3	4.2	76.0	11.1	0.5
38, Instruments and Related Products. . . . .	3,988	6.4	532	1.6	1.4	3.0	0.4	2.5	4.1	76.9	10.2	0.6
Employment size:												
20 to 99 . . . . .	30,502	2.8	1,500	1.0	0.5	1.1	0.2	1.7	4.3	79.1	12.1	0.3
100 to 499 . . . . .	10,321	7.6	1,680	2.4	2.2	2.7	0.3	3.2	5.7	75.0	8.6	0.5
500 and over . . . . .	2,168	22.6	4,666	4.7	7.0	10.6	0.3	4.6	7.4	56.1	9.4	0.7
Age of plant (years):												
Less than 5 . . . . .	4,893	4.0	508	1.6	1.4	0.8	0.2	1.3	4.2	86.4	4.0	0.7
5 to 15 . . . . .	13,722	5.0	1,661	1.7	1.2	1.8	0.3	2.6	5.3	83.1	4.1	0.5
16 to 30 . . . . .	11,303	6.2	1,668	1.6	1.3	3.0	0.3	2.5	5.0	82.5	3.7	0.7
Over 30 . . . . .	9,310	5.8	4,000	1.6	1.7	2.3	0.2	2.6	6.0	82.6	3.0	0.4
Not specified . . . . .	3,763	0.2	8	0.1	-	0.1	-	0.2	0.2	11.5	87.9	0.1
Manufacturing process:												
Fabrication/machining . . . . .	6,795	5.9	1,141	2.3	1.0	2.3	0.3	2.7	4.7	82.8	3.9	0.9
Assembly . . . . .	6,388	3.1	830	1.0	0.6	1.2	0.3	1.5	2.7	89.7	2.9	0.4
Both . . . . .	23,393	6.0	5,654	1.7	1.7	2.4	0.2	2.7	6.5	81.3	3.3	0.4
Neither . . . . .	2,577	2.9	217	0.4	0.7	1.8	-	0.9	1.4	86.6	8.2	1.1
Not specified . . . . .	3,838	0.2	3	0.1	0.1	-	-	0.4	0.3	12.2	86.9	0.1
Market for most products:												
Consumer . . . . .	4,358	3.8	674	0.8	1.7	1.3	-	1.9	5.1	83.4	5.9	0.7
Commercial . . . . .	5,791	6.0	3,195	2.7	1.0	2.2	0.1	3.3	5.0	83.2	2.5	1.0
Industrial . . . . .	18,796	5.4	2,357	1.5	1.1	2.4	0.4	1.8	5.3	84.2	3.3	0.5
Transportation . . . . .	3,974	5.6	588	2.1	1.9	1.4	0.2	3.6	5.4	82.1	3.4	0.6
Government . . . . .	2,141	7.0	452	0.8	2.2	3.9	0.1	4.1	6.2	78.8	3.9	0.8
Other . . . . .	3,679	4.9	378	1.7	1.7	1.3	0.2	2.5	4.6	83.3	4.8	0.7
Not specified . . . . .	4,252	1.1	201	0.1	0.3	0.6	0.1	0.5	1.0	18.7	78.7	0.4
Market price for most products:												
Less than \$5 . . . . .	5,274	4.4	838	1.6	1.0	1.7	0.1	2.1	3.7	85.6	4.2	0.7
\$5 to \$100 . . . . .	10,422	6.2	4,230	2.3	1.3	2.3	0.3	2.9	5.9	81.1	3.9	0.7
\$101 to \$1,000 . . . . .	8,846	6.3	1,113	1.5	1.4	3.1	0.3	2.2	4.3	83.8	3.3	0.7
\$1,001 to \$2,000 . . . . .	2,023	4.8	247	1.9	1.3	1.5	0.1	1.5	5.8	85.8	1.9	0.9
\$2,001 to \$10,000 . . . . .	4,265	4.0	254	0.7	1.4	1.7	0.2	2.2	5.8	84.7	3.2	0.6
Over \$10,000 . . . . .	7,340	4.5	1,065	1.0	1.6	1.7	0.2	2.8	5.5	84.1	3.0	0.5
Not specified . . . . .	4,821	1.7	100	0.9	0.5	0.3	-	0.2	2.1	24.4	71.6	0.7
Products made to military specifications:												
Yes . . . . .	14,112	8.3	5,478	2.3	1.8	3.9	0.3	3.2	6.7	79.0	2.9	0.6
No . . . . .	22,214	3.8	2,131	1.3	1.2	1.1	0.2	2.0	4.5	85.4	4.1	0.3
Don't know . . . . .	2,939	2.9	236	0.8	0.9	1.2	-	1.8	3.5	87.3	4.6	0.7
Not specified . . . . .	3,726	0.1	-	0.1	-	-	-	-	0.5	10.6	88.8	0.1
Percent, on an annual basis, of all products manufactured at the plant, that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	7.8	1,775	2.3	1.6	3.5	0.4	3.1	6.7	80.1	2.4	0.8
26 to 75 percent . . . . .	2,499	7.5	367	1.4	1.0	4.4	0.7	2.7	6.7	81.1	2.0	1.4
Over 75 percent . . . . .	1,148	8.4	227	1.2	3.2	4.0	-	2.7	4.3	79.6	5.0	2.1
None . . . . .	11,808	3.5	996	1.3	1.2	0.9	0.1	2.3	4.5	85.5	4.2	0.4
Don't know . . . . .	13,573	4.5	4,367	1.4	1.3	1.6	0.2	2.0	4.7	84.6	4.2	0.4
Not specified . . . . .	4,029	1.3	113	0.6	0.1	0.6	-	-	0.2	15.0	83.5	0.6

See footnotes at the end of the table.



Table 6E. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: MATERIALS WORKING LASERS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	3.2	759	1.2	0.9	1.0	0.1	1.8	5.0	85.1	4.9	0.5
Less than 10 percent .....	15,360	5.2	4,856	1.6	1.5	1.9	0.2	3.2	5.3	83.2	3.2	0.5
10 to 19 percent .....	4,737	7.3	905	1.7	1.7	3.6	0.3	2.3	6.8	81.4	2.3	0.8
20 to 49 percent .....	3,912	9.4	941	2.5	1.6	4.4	0.9	2.4	4.5	81.0	2.6	1.1
50 percent or more .....	1,398	9.6	281	3.6	1.7	3.9	0.4	0.9	3.9	82.8	2.8	1.9
Not specified .....	3,897	0.7	104	0.2	0.3	0.2	-	0.1	0.6	12.3	86.3	0.2
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	5.1	175	1.4	1.6	1.3	0.8	1.5	3.8	87.5	2.2	1.4
In the plant .....	25,416	5.7	5,787	1.7	1.4	2.3	0.3	2.6	5.6	82.3	3.8	0.4
Elsewhere in the firm .....	4,969	8.1	1,621	2.3	2.6	2.9	0.3	3.4	3.9	81.1	3.5	0.8
No research and development done .....	7,046	2.6	254	0.8	0.4	1.4	-	1.2	4.8	87.8	3.7	0.7
Not specified .....	3,726	0.3	9	0.1	0.1	0.1	-	-	1.0	9.2	89.5	0.1
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	5.6	6,500	1.9	1.4	2.1	0.2	2.3	5.1	82.9	4.0	0.3
Elsewhere in the firm .....	1,099	9.1	678	1.7	1.8	4.0	1.6	2.5	6.7	79.6	1.9	1.7
Outside the firm .....	3,506	6.0	427	1.5	0.9	3.6	-	3.9	9.8	78.4	1.9	1.2
No formal training for staff. ....	5,251	2.7	233	0.4	1.3	0.9	0.1	1.9	2.4	89.5	3.4	0.5
Not specified .....	3,686	0.3	7	0.1	0.1	0.1	-	0.2	0.2	9.2	90.2	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant . . . .	26,952	5.0	5,532	1.8	1.3	1.7	0.2	2.2	4.9	83.8	4.1	0.3
Staff from outside the plant . . .	1,637	9.4	1,156	2.4	2.1	4.5	0.4	3.5	6.8	78.2	2.1	1.5
Trainers from outside the firm .	5,287	8.3	927	1.9	1.4	4.6	0.4	3.8	9.6	76.5	1.8	1.2
Not specified .....	9,115	1.9	230	0.3	0.9	0.6	0.1	1.2	1.5	56.6	38.8	0.3
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	4.4	1,524	1.4	0.9	1.8	0.3	1.8	3.5	86.9	3.5	0.4
Some problems .....	19,836	6.1	5,557	1.6	1.6	2.6	0.3	2.7	6.5	81.5	3.2	0.4
Very difficult .....	5,401	5.5	755	2.5	1.7	1.3	-	3.0	5.4	81.0	5.2	0.9
Not specified .....	3,849	0.1	9	0.1	-	-	-	0.1	0.2	12.4	87.2	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	10.3	862	2.9	2.4	4.3	0.7	3.3	6.3	77.4	2.7	1.1
No .....	34,703	4.8	6,655	1.5	1.2	1.9	0.2	2.3	5.0	84.0	3.8	0.3
Don't know .....	1,447	7.3	329	2.4	2.1	2.4	0.4	3.0	6.8	79.4	3.5	1.3
Not specified .....	3,576	0.1	-	0.1	-	-	-	0.1	0.2	6.8	92.8	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 6F. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: MATERIALS WORKING LASERS

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	4.9	2.2	1.1	0.6	0.7	0.3	0.3
Major Group:								
34, Fabricated Metal Products.....	13,190	3.4	1.2	1.2	0.2	0.5	0.3	0.5
35, Industrial Machinery and Equipment.....	14,231	4.3	1.4	1.1	0.5	0.8	0.4	0.5
36, Electronic and Other Electric Equipment.....	7,472	7.8	4.3	1.2	1.1	0.7	0.5	0.7
37, Transportation Equipment.....	4,110	5.4	3.1	0.8	0.8	0.6	0.1	0.5
38, Instruments and Related Products.....	3,988	6.2	3.9	1.0	0.6	0.5	0.2	0.6
Employment size:								
20 to 99.....	30,502	2.8	0.9	0.8	0.3	0.6	0.2	0.3
100 to 499.....	10,321	7.5	4.1	1.5	0.9	0.6	0.4	0.5
500 and over.....	2,168	22.6	12.6	4.2	2.6	2.3	1.1	0.7
Age of plant (years):								
Less than 5.....	4,893	4.0	2.3	0.8	0.4	0.3	0.2	0.7
5 to 15.....	13,722	4.9	2.3	0.9	0.6	0.8	0.3	0.5
16 to 30.....	11,303	6.2	2.4	1.9	0.6	1.0	0.4	0.7
Over 30.....	9,310	5.7	2.7	1.3	0.7	0.6	0.5	0.4
Not specified.....	3,763	0.1	0.1	-	-	-	-	0.1
Manufacturing process:								
Fabrication/machining.....	6,795	6.0	2.3	1.1	0.9	1.0	0.7	0.9
Assembly.....	6,388	3.2	1.9	0.3	0.4	0.4	0.2	0.4
Both.....	23,393	6.1	2.8	1.5	0.7	0.8	0.3	0.4
Neither.....	2,577	2.9	1.3	1.3	-	-	0.3	1.1
Not specified.....	3,838	0.2	0.1	-	-	-	0.2	0.1
Market for most products:								
Consumer.....	4,358	3.8	1.9	0.7	0.3	0.8	0.1	0.7
Commercial.....	5,791	6.1	2.3	1.9	0.8	0.8	0.3	1.0
Industrial.....	18,796	5.3	2.4	1.3	0.5	0.7	0.5	0.5
Transportation.....	3,974	5.6	2.2	1.3	1.0	0.8	0.3	0.6
Government.....	2,141	7.0	4.6	0.8	0.7	0.7	0.1	0.8
Other.....	3,679	4.9	2.5	0.8	0.7	0.5	0.3	0.7
Not specified.....	4,252	1.1	0.4	0.2	0.1	0.3	0.1	0.4
Market price for most products:								
Less than \$5.....	5,274	4.4	1.8	0.8	0.5	1.1	0.2	0.7
\$5 to \$100.....	10,422	6.1	2.2	1.1	1.0	1.1	0.6	0.7
\$101 to \$1,000.....	8,846	6.3	3.2	1.8	0.3	0.5	0.4	0.7
\$1,001 to \$2,000.....	2,023	4.9	2.5	1.2	0.4	0.8	-	0.9
\$2,001 to \$10,000.....	4,265	4.0	2.2	1.3	0.3	0.1	0.1	0.6
Over \$10,000.....	7,340	4.6	2.5	1.1	0.4	0.4	0.3	0.5
Not specified.....	4,821	1.7	0.5	0.2	0.5	0.4	0.1	0.7
Products made to military specifications:								
Yes.....	14,112	8.3	3.5	1.9	1.0	1.6	0.3	0.6
No.....	22,214	3.9	1.9	0.9	0.4	0.3	0.4	0.3
Don't know.....	2,939	2.8	1.3	0.8	0.6	-	0.1	0.7
Not specified.....	3,726	0.1	0.1	-	-	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	7.7	2.8	2.2	0.6	1.5	0.6	0.8
26 to 75 percent.....	2,499	7.4	3.3	2.2	0.6	0.6	0.7	1.4
Over 75 percent.....	1,148	8.4	4.6	0.6	1.9	1.3	-	2.1
None.....	11,808	3.5	2.0	0.7	0.3	0.4	0.2	0.4
Don't know.....	13,573	4.5	2.2	0.9	0.8	0.5	0.2	0.4
Not specified.....	4,029	1.3	0.4	0.4	0.1	-	0.4	0.6

See footnotes at the end of the table.

Table 6F. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: MATERIALS WORKING LASERS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	3.3	1.0	1.1	0.5	0.5	0.2	0.5
Less than 10 percent .....	15,360	5.2	2.2	1.3	0.5	0.7	0.4	0.5
10 to 19 percent .....	4,737	7.3	4.0	1.2	1.0	0.5	0.6	0.8
20 to 49 percent .....	3,912	9.4	5.3	1.7	0.5	1.3	0.7	1.1
50 percent or more .....	1,398	9.6	5.0	1.6	1.1	1.6	0.2	1.9
Not specified .....	3,897	0.6	0.3	0.2	-	0.1	-	0.2
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	5.1	2.2	0.5	0.1	1.2	1.1	1.4
In this plant .....	25,416	5.7	2.6	1.2	0.6	0.8	0.4	0.4
Elsewhere in the firm .....	4,969	8.0	4.4	1.3	1.3	0.5	0.4	0.8
No research and development done ..	7,046	2.5	0.4	1.5	0.3	0.4	-	0.7
Not specified .....	3,726	0.2	0.1	0.1	-	-	-	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	5.6	2.6	1.3	0.6	0.8	0.4	0.3
Elsewhere in the firm .....	1,099	9.2	4.3	0.5	1.3	1.2	1.9	1.7
Outside the firm .....	3,506	6.0	2.3	2.1	0.6	0.8	0.2	1.2
No formal training for staff conducted .....	5,251	2.8	1.1	0.7	0.5	0.5	-	0.5
Not specified .....	3,686	0.2	0.2	-	-	-	-	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	5.0	2.4	1.0	0.5	0.8	0.3	0.3
Staff from outside the plant .....	1,637	9.5	5.8	0.9	1.6	0.9	0.2	1.5
Trainers from outside the firm .....	5,287	8.3	3.0	3.2	0.7	0.6	0.8	1.2
Not specified .....	9,115	1.9	0.8	0.4	0.4	0.3	0.1	0.3
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	4.4	2.0	0.9	0.4	0.6	0.5	0.4
Some problems .....	19,836	6.1	2.7	1.6	0.7	0.8	0.2	0.4
Very difficult .....	5,401	5.5	2.4	0.9	0.9	0.9	0.4	0.9
Not specified .....	3,849	0.1	0.1	-	-	-	-	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	10.3	5.2	1.4	1.3	1.6	0.8	1.1
No .....	34,703	4.8	2.1	1.3	0.5	0.7	0.3	0.3
Don't know .....	1,447	7.3	4.0	0.8	1.2	0.5	0.7	1.3
Not specified .....	3,576	0.1	0.1	-	-	-	-	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 6G. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: PICK AND PLACE ROBOTS

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated workstations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	8.5	31,512	1.9	3.0	3.4	0.2	3.6	4.7	72.2	11.0	0.3
Major Group:												
34, Fabricated Metal Products.	13,190	6.7	5,148	1.5	2.4	2.7	0.1	4.1	5.4	72.0	11.9	0.5
35, Industrial Machinery and Equipment . . . . .	14,231	5.3	4,672	1.4	1.5	2.2	0.2	2.5	3.2	78.6	10.3	0.5
36, Electronic and Other Electric Equipment. . . . .	7,472	15.2	13,809	3.3	5.6	5.9	0.4	4.8	6.7	62.0	11.2	0.8
37, Transportation Equipment .	4,110	10.2	5,177	2.0	3.2	4.7	0.3	3.6	3.8	71.4	11.0	0.8
38, Instruments and Related Products. . . . .	3,988	11.6	2,707	2.3	5.0	3.9	0.4	3.5	4.8	69.8	10.3	0.8
Employment size:												
20 to 99. . . . .	30,502	3.7	4,375	1.2	1.4	1.0	0.1	2.6	3.5	78.2	12.1	0.3
100 to 499. . . . .	10,321	15.9	10,041	3.4	5.7	6.3	0.5	6.3	7.8	61.7	8.3	0.6
500 and over. . . . .	2,168	42.7	17,096	4.9	12.6	23.9	1.3	4.2	6.5	37.8	8.7	0.8
Age of plant (years):												
Less than 5. . . . .	4,893	8.2	2,566	2.7	4.0	1.3	0.2	2.5	5.3	80.4	3.6	1.0
5 to 15. . . . .	13,722	8.7	8,314	2.1	3.5	2.8	0.3	4.1	4.6	78.6	3.9	0.6
16 to 30. . . . .	11,303	9.4	8,067	2.3	3.0	3.8	0.3	4.3	6.0	76.6	3.8	0.6
Over 30. . . . .	9,310	10.8	12,533	1.5	2.8	6.3	0.2	3.9	4.8	77.4	3.1	0.6
Not specified. . . . .	3,763	0.1	32	0.1	-	-	-	0.2	-	11.7	88.0	0.1
Manufacturing process:												
Fabrication/machining. . . . .	6,795	7.6	3,408	1.5	2.7	3.2	0.2	3.0	4.0	81.3	4.1	0.9
Assembly. . . . .	6,388	12.5	5,570	2.6	5.1	4.4	0.4	3.9	6.1	74.1	3.3	0.9
Both. . . . .	23,393	9.8	21,977	2.2	3.2	4.1	0.3	4.3	5.6	77.4	3.0	0.4
Neither. . . . .	2,577	2.2	498	0.9	0.8	0.5	-	2.6	1.7	85.5	8.0	0.5
Not specified. . . . .	3,838	0.5	60	0.4	0.1	-	-	0.4	0.2	11.9	86.9	0.4
Market for most products:												
Consumer. . . . .	4,358	12.8	5,968	2.2	4.6	5.6	0.4	6.4	6.7	68.9	5.1	0.9
Commercial. . . . .	5,791	10.6	6,259	2.2	4.5	3.7	0.2	4.4	5.7	77.1	2.2	0.9
Industrial. . . . .	18,796	7.7	9,446	2.2	2.5	2.8	0.2	2.5	4.7	81.7	3.4	0.5
Transportation. . . . .	3,974	14.7	6,877	2.9	4.6	6.7	0.5	6.4	5.5	69.9	3.4	1.1
Government. . . . .	2,141	9.8	633	2.0	3.5	4.3	-	4.9	5.9	75.5	3.9	1.1
Other. . . . .	3,679	5.7	2,174	0.9	1.9	2.8	0.1	3.9	4.3	81.2	4.9	0.7
Not specified. . . . .	4,252	1.0	156	0.1	0.4	0.4	0.1	1.0	0.3	19.0	78.7	0.3
Market price for most products:												
Less than \$5. . . . .	5,274	16.4	7,359	4.1	5.2	6.7	0.4	5.9	6.7	67.4	3.6	1.2
\$5 to \$100. . . . .	10,422	14.7	16,537	3.3	5.3	5.7	0.4	5.1	7.6	68.9	3.7	0.9
\$101 to \$1,000. . . . .	8,846	6.5	3,988	1.5	2.3	2.5	0.2	3.7	4.1	82.5	3.2	0.5
\$1,001 to \$2,000. . . . .	2,023	6.0	488	1.5	2.7	1.5	0.3	2.7	3.7	83.9	3.7	1.0
\$2,001 to \$10,000. . . . .	4,265	4.2	708	0.6	1.4	2.0	0.2	2.0	3.9	86.6	3.3	0.6
Over \$10,000. . . . .	7,340	4.4	2,230	0.5	1.6	2.2	0.1	2.8	2.5	87.2	3.1	0.3
Not specified. . . . .	4,821	1.4	204	0.7	0.4	0.3	-	0.5	1.7	24.8	71.5	0.4
Products made to military specifications:												
Yes. . . . .	14,112	10.5	13,787	2.7	3.1	4.5	0.2	4.6	7.0	75.0	2.8	0.6
No. . . . .	22,214	8.9	15,625	1.8	3.5	3.3	0.3	3.7	4.2	78.9	4.2	0.4
Don't know. . . . .	2,939	5.7	2,009	0.8	1.7	3.0	0.2	2.5	3.0	85.1	3.7	0.8
Not specified. . . . .	3,726	0.2	91	0.1	-	0.1	-	-	0.2	10.8	88.8	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent. . . . .	9,934	10.8	8,378	2.7	3.4	4.5	0.2	5.4	6.3	75.1	2.4	0.8
26 to 75 percent. . . . .	2,499	7.1	767	2.3	1.8	3.0	-	2.0	5.7	82.8	2.3	1.0
Over 75 percent. . . . .	1,148	8.1	512	1.2	3.5	3.3	0.1	5.3	5.9	75.7	5.0	1.8
None. . . . .	11,808	7.6	8,635	1.4	2.9	2.9	0.4	3.5	4.1	80.9	3.9	0.5
Don't know. . . . .	13,573	10.3	13,061	2.3	3.7	4.1	0.2	3.5	5.0	77.2	4.1	0.6
Not specified. . . . .	4,029	0.8	160	0.2	0.2	0.3	0.1	0.3	0.3	14.7	83.9	0.2

See footnotes at the end of the table.

Table 6G. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: PICK AND PLACE ROBOTS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated workstations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	5.5	4,482	1.8	1.8	1.8	0.1	2.7	3.5	83.6	4.8	0.5
Less than 10 percent .....	15,360	10.5	16,124	2.3	3.3	4.7	0.2	4.9	6.8	74.7	3.1	0.5
10 to 19 percent .....	4,737	12.3	4,838	2.0	5.0	4.9	0.4	5.2	6.0	74.2	2.3	0.9
20 to 49 percent .....	3,912	13.4	3,493	2.7	5.1	4.9	0.7	3.5	4.0	76.3	2.6	1.1
50 percent or more .....	1,398	11.6	2,371	1.4	5.2	4.1	0.9	2.4	2.1	81.1	2.7	2.0
Not specified .....	3,897	0.9	203	0.1	0.3	0.5	-	0.2	0.4	12.1	86.5	0.2
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	9.8	1,274	2.9	4.3	2.2	0.4	1.1	5.1	81.8	2.1	1.8
In the plant .....	25,416	8.8	15,169	2.3	3.0	3.3	0.2	4.6	5.6	77.4	3.6	0.4
Elsewhere in the firm .....	4,969	21.2	13,959	2.9	7.6	10.1	0.6	4.9	7.0	63.4	3.4	1.1
No research and development done .....	7,046	2.7	1,050	0.6	0.9	1.2	-	1.5	2.0	90.4	3.4	0.6
Not specified .....	3,726	0.3	61	0.1	0.1	0.1	-	0.1	0.2	9.1	90.4	0.2
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	9.6	25,913	2.1	3.4	3.8	0.3	3.9	5.3	77.3	3.8	0.4
Elsewhere in the firm .....	1,099	22.0	1,963	4.8	7.9	8.9	0.4	8.3	4.9	60.7	4.1	2.7
Outside the firm .....	3,506	12.2	2,956	2.8	3.9	5.3	0.2	4.8	6.2	74.8	2.0	1.2
No formal training for staff .....	5,251	3.0	647	0.9	1.0	1.0	0.1	2.5	3.3	88.0	3.3	0.6
Not specified .....	3,686	0.2	34	0.1	-	0.1	-	0.4	0.1	9.3	90.2	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	8.9	21,984	2.0	3.2	3.4	0.3	3.6	4.9	78.6	4.0	0.4
Staff from outside the plant .....	1,637	23.8	3,289	5.4	8.0	10.2	0.2	5.9	6.6	60.3	3.5	2.3
Trainers from outside the firm .....	5,287	13.4	5,415	2.9	4.3	5.9	0.3	6.3	7.5	71.2	1.6	1.0
Not specified .....	9,115	1.9	824	0.5	0.7	0.7	-	1.6	2.0	55.8	38.7	0.4
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	7.5	6,944	1.8	2.5	3.1	0.1	3.5	3.8	81.4	3.9	0.5
Some problems .....	19,836	11.2	21,035	2.4	4.0	4.4	0.4	4.1	5.9	75.9	2.9	0.5
Very difficult .....	5,401	7.3	3,501	1.6	2.6	3.0	0.1	4.7	5.8	77.1	5.0	0.9
Not specified .....	3,849	0.3	32	0.1	-	0.2	-	-	0.1	12.6	87.1	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	19.2	8,042	4.1	7.6	6.7	0.8	5.1	6.8	66.6	2.2	1.4
No .....	34,703	7.9	20,455	1.9	2.7	3.1	0.2	3.7	4.9	79.8	3.7	0.3
Don't know .....	1,447	21.3	3,015	2.8	7.4	10.8	0.3	5.9	5.4	62.5	4.8	2.0
Not specified .....	3,576	0.1	-	0.1	-	-	-	0.2	-	7.0	92.7	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 6H. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: PICK AND PLACE ROBOTS

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" <sup>3</sup> (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	8.5	1.5	3.3	2.9	0.3	0.5	0.3
Major Group:								
34, Fabricated Metal Products.....	13,190	6.6	0.9	2.9	2.1	0.2	0.3	0.5
35, Industrial Machinery and Equipment.....	14,231	5.5	0.7	2.4	1.8	0.1	0.4	0.5
36, Electronic and Other Electric Equipment.....	7,472	15.2	3.4	5.0	5.0	0.7	1.1	0.8
37, Transportation Equipment.....	4,110	10.1	1.4	3.9	4.3	0.2	0.3	0.8
38, Instruments and Related Products.....	3,988	11.7	2.5	3.8	4.5	0.2	0.7	0.8
Employment size:								
20 to 99.....	30,502	3.6	0.6	1.7	0.9	0.2	0.2	0.3
100 to 499.....	10,321	15.8	2.8	5.7	5.9	0.4	1.0	0.6
500 and over.....	2,168	42.8	8.4	13.4	17.7	1.2	2.2	0.8
Age of plant (years):								
Less than 5.....	4,893	8.1	1.9	3.0	2.5	0.2	0.6	1.0
5 to 15.....	13,722	8.7	2.0	3.6	2.2	0.3	0.6	0.6
16 to 30.....	11,303	9.4	1.4	3.6	3.5	0.4	0.5	0.6
Over 30.....	9,310	10.8	1.1	3.9	4.8	0.4	0.5	0.6
Not specified.....	3,763	0.1	-	0.1	-	-	-	0.1
Manufacturing process:								
Fabrication/machining.....	6,795	7.5	1.5	3.2	2.3	-	0.5	0.9
Assembly.....	6,388	12.6	3.4	4.6	3.3	0.5	0.8	0.9
Both.....	23,393	9.7	1.3	3.7	3.8	0.4	0.5	0.4
Neither.....	2,577	2.3	0.4	1.0	0.5	-	0.3	0.5
Not specified.....	3,838	0.6	-	0.4	-	-	0.1	0.4
Market for most products:								
Consumer.....	4,358	12.8	1.9	3.1	6.5	0.5	0.9	0.9
Commercial.....	5,791	10.6	2.1	4.6	3.0	0.5	0.5	0.9
Industrial.....	18,796	7.7	1.3	3.4	2.2	0.2	0.5	0.5
Transportation.....	3,974	14.8	2.2	5.5	6.0	0.3	0.8	1.1
Government.....	2,141	9.8	2.3	3.4	3.3	0.5	0.2	1.1
Other.....	3,679	5.8	1.5	2.0	1.7	0.3	0.2	0.7
Not specified.....	4,252	0.9	-	0.2	0.5	-	0.2	0.3
Market price for most products:								
Less than \$5.....	5,274	16.4	2.2	6.5	6.1	0.3	1.2	1.2
\$5 to \$100.....	10,422	14.7	2.4	6.0	4.9	0.4	1.0	0.9
\$101 to \$1,000.....	8,846	6.5	1.3	2.2	2.3	0.3	0.4	0.5
\$1,001 to \$2,000.....	2,023	6.1	2.0	1.8	1.1	0.9	0.2	1.0
\$2,001 to \$10,000.....	4,265	4.2	0.6	1.8	1.8	0.1	-	0.6
Over \$10,000.....	7,340	4.4	1.1	1.4	1.6	0.2	0.1	0.3
Not specified.....	4,821	1.5	0.2	0.7	0.4	-	0.2	0.4
Products made to military specifications:								
Yes.....	14,112	10.6	1.7	4.3	3.7	0.3	0.7	0.6
No.....	22,214	9.0	1.7	3.5	3.0	0.3	0.5	0.4
Don't know.....	2,939	5.7	0.9	1.2	2.8	0.3	0.6	0.8
Not specified.....	3,726	0.1	-	0.1	0.1	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	10.8	1.5	4.6	3.5	0.3	0.9	0.8
26 to 75 percent.....	2,499	7.1	1.3	3.5	2.2	0.1	0.1	1.0
Over 75 percent.....	1,148	8.1	1.5	2.7	3.7	0.2	0.1	1.8
None.....	11,808	7.6	1.2	2.7	2.8	0.4	0.5	0.5
Don't know.....	13,573	10.2	2.1	3.7	3.6	0.3	0.5	0.6
Not specified.....	4,029	0.8	0.2	0.3	0.1	-	0.1	0.2

See footnotes at the end of the table.



Table 6H. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: PICK AND PLACE ROBOTS**—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	5.4	1.3	2.0	1.4	0.2	0.6	0.5
Less than 10 percent .....	15,360	10.5	1.2	4.3	4.1	0.4	0.4	0.5
10 to 19 percent .....	4,737	12.3	2.2	4.4	4.8	0.2	0.7	0.9
20 to 49 percent .....	3,912	13.5	3.2	4.6	4.4	0.7	0.6	1.1
50 percent or more .....	1,398	11.6	3.0	4.9	2.6	0.1	0.9	2.0
Not specified .....	3,897	0.9	-	0.5	0.4	-	-	0.2
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	9.9	2.4	2.7	3.8	-	0.9	1.8
In this plant .....	25,416	8.8	1.6	3.3	2.9	0.3	0.6	0.4
Elsewhere in the firm .....	4,969	21.2	3.0	8.1	8.2	0.6	1.2	1.1
No research and development done ..	7,046	2.7	0.4	1.7	0.6	-	-	0.6
Not specified .....	3,726	0.3	-	0.1	0.1	0.1	-	0.2
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	9.6	1.8	3.7	3.2	0.4	0.6	0.4
Elsewhere in the firm .....	1,099	22.0	2.7	8.9	9.0	0.5	0.8	2.7
Outside the firm .....	3,506	12.2	2.0	5.3	4.1	0.2	0.5	1.2
No formal training for staff conducted .....	5,251	2.9	0.2	0.8	1.3	0.1	0.6	0.6
Not specified .....	3,686	0.1	-	0.1	0.1	-	-	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	8.9	1.8	3.3	2.9	0.3	0.5	0.4
Staff from outside the plant .....	1,637	23.7	2.6	9.3	9.5	0.6	1.6	2.3
Trainers from outside the firm .....	5,287	13.4	2.1	5.9	4.8	0.2	0.4	1.0
Not specified .....	9,115	2.0	0.1	0.5	0.8	0.1	0.4	0.4
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	7.5	1.5	2.6	2.8	0.3	0.4	0.5
Some problems .....	19,836	11.2	1.8	4.4	3.9	0.4	0.7	0.5
Very difficult .....	5,401	7.4	1.5	3.1	2.0	0.2	0.6	0.9
Not specified .....	3,849	0.2	-	0.2	-	-	-	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	19.2	4.8	6.8	6.1	0.3	1.2	1.4
No .....	34,703	7.9	1.2	3.2	2.6	0.3	0.5	0.3
Don't know .....	1,447	21.4	3.7	6.4	10.4	0.2	0.8	2.0
Not specified .....	3,576	0.1	-	0.1	-	-	-	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 6I. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: OTHER ROBOTS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	4.7	20,706	0.9	1.8	1.9	0.1	3.1	4.3	76.5	11.4	0.2
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	3.7	2,839	0.8	1.5	1.3	0.1	3.2	4.4	76.3	12.3	0.4
35, Industrial Machinery and Equipment . . . . .	14,231	3.7	1,817	0.6	1.5	1.4	0.2	2.5	3.8	79.7	10.4	0.3
36, Electronic and Other Electric Equipment . . . . .	7,472	5.3	5,083	1.0	2.0	2.1	0.2	4.1	4.9	73.9	11.8	0.4
37, Transportation Equipment . . . . .	4,110	11.7	10,128	2.5	3.8	5.2	0.2	2.7	4.6	69.3	11.7	0.9
38, Instruments and Related Products. . . . .	3,988	3.8	839	1.0	1.1	1.5	0.2	3.6	4.7	77.5	10.5	0.4
Employment size:												
20 to 99 . . . . .	30,502	1.4	1,057	0.4	0.6	0.3	0.1	2.4	3.0	81.0	12.3	0.2
100 to 499 . . . . .	10,321	9.5	4,811	2.0	4.1	3.1	0.3	4.6	7.6	69.2	9.0	0.5
500 and over . . . . .	2,168	29.6	14,838	3.1	7.9	18.0	0.6	5.6	7.9	46.9	10.0	0.7
Age of plant (years):												
Less than 5 . . . . .	4,893	3.0	1,041	1.0	1.8	-	0.2	4.0	4.4	84.5	4.0	0.5
5 to 15 . . . . .	13,722	4.2	6,410	1.0	1.7	1.4	0.1	3.4	4.1	84.2	4.1	0.4
16 to 30 . . . . .	11,303	5.2	5,087	0.9	2.1	1.9	0.3	3.6	5.5	81.7	4.0	0.4
Over 30 . . . . .	9,310	7.6	8,159	1.2	2.1	4.2	0.1	2.8	4.9	80.7	3.9	0.5
Not specified . . . . .	3,763	0.1	9	-	-	0.1	-	0.2	-	11.8	88.0	0.1
Manufacturing process:												
Fabrication/machining . . . . .	6,795	2.0	535	0.6	0.7	0.6	0.1	2.5	4.6	86.5	4.3	0.5
Assembly . . . . .	6,388	4.7	7,903	0.8	1.9	1.8	0.2	2.9	4.4	84.8	3.1	0.4
Both . . . . .	23,393	6.6	12,045	1.2	2.5	2.7	0.2	3.8	5.3	80.7	3.6	0.3
Neither . . . . .	2,577	1.8	217	0.9	0.5	0.4	-	2.3	1.4	86.3	8.2	0.6
Not specified . . . . .	3,838	0.1	6	-	0.1	-	-	0.7	0.2	12.0	86.9	0.1
Market for most products:												
Consumer . . . . .	4,358	7.3	5,397	1.1	2.4	3.6	0.2	3.4	5.5	78.0	5.8	0.7
Commercial . . . . .	5,791	4.0	1,221	0.9	1.3	1.6	0.2	5.5	5.0	82.6	2.9	0.4
Industrial . . . . .	18,796	3.6	6,097	0.8	1.4	1.2	0.2	2.5	4.2	86.0	3.7	0.3
Transportation . . . . .	3,974	13.5	6,648	2.8	5.3	5.2	0.2	4.5	6.7	71.0	4.3	1.1
Government . . . . .	2,141	4.9	313	0.9	1.6	2.3	0.1	3.2	5.5	82.3	4.1	0.5
Other . . . . .	3,679	4.0	660	0.5	1.8	1.7	-	3.2	4.1	84.5	4.1	0.5
Not specified . . . . .	4,252	0.9	370	-	0.3	0.4	0.2	0.7	0.2	19.3	79.0	0.2
Market price for most products:												
Less than \$5 . . . . .	5,274	4.4	3,557	1.2	1.7	1.4	0.1	5.2	4.9	80.3	5.1	0.6
\$5 to \$100 . . . . .	10,422	6.0	5,793	1.2	2.5	2.0	0.3	4.2	6.6	78.9	4.2	0.4
\$101 to \$1,000 . . . . .	8,846	5.6	2,586	1.3	2.0	2.2	0.1	2.4	3.9	85.4	2.7	0.6
\$1,001 to \$2,000 . . . . .	2,023	4.2	362	0.4	2.3	1.5	-	2.6	2.7	86.7	3.8	0.8
\$2,001 to \$10,000 . . . . .	4,265	3.5	418	0.7	1.0	1.7	0.1	3.8	4.5	84.9	3.3	0.4
Over \$10,000 . . . . .	7,340	5.4	7,929	0.8	1.7	2.8	0.1	2.6	2.7	86.0	3.2	0.4
Not specified . . . . .	4,821	0.6	61	-	0.4	0.2	-	0.3	2.6	24.2	72.3	0.3
Products made to military specifications:												
Yes . . . . .	14,112	5.4	7,975	1.1	1.9	2.3	0.1	4.6	6.1	80.8	3.2	0.4
No . . . . .	22,214	5.2	10,578	1.1	2.0	1.9	0.2	2.8	4.2	83.4	4.5	0.3
Don't know . . . . .	2,939	4.6	2,115	0.6	1.5	2.4	0.1	2.6	2.4	85.9	4.6	0.7
Not specified . . . . .	3,726	0.1	37	-	-	0.1	-	-	-	11.1	88.8	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	5.7	4,745	1.1	2.0	2.4	0.2	5.3	5.8	80.5	2.9	0.5
26 to 75 percent . . . . .	2,499	2.6	186	0.8	0.8	1.0	-	2.4	4.4	88.3	2.3	0.5
Over 75 percent . . . . .	1,148	2.0	109	0.7	0.3	1.0	-	2.3	6.4	86.6	2.6	0.6
None . . . . .	11,808	5.4	5,988	1.1	2.1	2.0	0.2	2.5	3.5	84.5	4.1	0.4
Don't know . . . . .	13,573	5.3	9,657	0.9	2.2	2.1	0.1	3.2	5.1	81.7	4.8	0.4
Not specified . . . . .	4,029	0.3	41	0.2	-	-	0.1	0.2	0.1	15.4	83.9	0.3

See footnotes at the end of the table.

Table 6I. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: OTHER ROBOTS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None . . . . .	13,687	2.9	3,480	0.4	1.4	1.0	0.1	1.8	3.7	86.4	5.1	0.3
Less than 10 percent . . . . .	15,360	6.2	9,713	1.4	2.3	2.4	0.1	4.4	5.5	80.4	3.5	0.4
10 to 19 percent . . . . .	4,737	7.8	3,201	1.5	2.3	3.8	0.2	3.5	5.7	80.6	2.4	0.7
20 to 49 percent . . . . .	3,912	6.3	1,823	1.1	2.1	2.6	0.5	4.5	4.7	81.5	3.1	0.6
50 percent or more . . . . .	1,398	4.3	2,424	1.1	1.6	1.4	0.2	4.6	3.9	84.7	2.6	0.9
Not specified . . . . .	3,897	0.4	64	-	-	0.4	-	0.1	0.2	12.9	86.5	0.2
Where is most of the research and development work for the plant done:												
Outside the firm . . . . .	1,834	3.7	404	0.9	2.7	0.1	-	1.0	3.1	89.9	2.3	0.8
In the plant . . . . .	25,416	4.5	7,057	1.0	1.7	1.7	0.1	4.1	5.1	82.3	4.0	0.3
Elsewhere in the firm . . . . .	4,969	14.7	12,050	2.5	4.9	6.9	0.4	4.3	6.7	70.5	3.7	0.9
No research and development done . . . . .	7,046	0.9	1,069	0.1	0.4	0.4	-	0.9	2.6	91.9	3.8	0.2
Not specified . . . . .	3,726	0.3	125	-	0.2	-	0.1	-	0.1	9.2	90.4	0.1
Where is most of the formal training for the plant conducted:												
In the plant . . . . .	29,449	5.2	17,387	1.0	2.0	2.0	0.2	3.4	5.0	82.0	4.3	0.2
Elsewhere in the firm . . . . .	1,099	13.3	801	1.2	4.8	7.1	0.2	8.6	4.3	71.8	2.1	1.8
Outside the firm . . . . .	3,506	7.4	1,805	2.2	2.3	2.6	0.3	3.9	4.9	81.5	2.3	0.9
No formal training for staff. . . . .	5,251	2.0	699	0.5	0.9	0.6	-	1.8	3.0	89.8	3.4	0.5
Not specified . . . . .	3,686	0.1	13	-	-	-	0.1	0.2	0.1	9.4	90.2	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant . . . . .	26,952	4.6	14,288	1.0	1.7	1.7	0.2	3.1	4.6	83.1	4.5	0.3
Staff from outside the plant . . . . .	1,637	13.4	1,686	1.5	4.7	7.2	-	7.5	6.3	70.2	2.6	1.4
Trainers from outside the firm . . . . .	5,287	8.6	3,846	1.8	3.0	3.6	0.2	5.0	6.1	78.4	1.9	0.7
Not specified . . . . .	9,115	1.4	886	0.3	0.6	0.4	0.1	1.2	2.0	56.8	38.6	0.3
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult . . . . .	13,905	4.1	4,270	1.1	1.3	1.7	-	2.6	3.8	85.2	4.3	0.4
Some problems . . . . .	19,836	6.2	12,858	1.0	2.4	2.5	0.3	3.6	5.4	81.5	3.4	0.3
Very difficult . . . . .	5,401	4.6	3,572	1.1	1.9	1.4	0.2	4.9	4.8	80.9	4.9	0.5
Not specified . . . . .	3,849	-	4	-	-	-	-	-	-	12.9	87.1	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes . . . . .	3,265	12.4	3,583	2.3	5.4	4.3	0.4	4.7	5.9	74.3	2.9	1.0
No . . . . .	34,703	4.1	15,466	0.8	1.5	1.7	0.1	3.3	4.5	84.0	4.0	0.2
Don't know . . . . .	1,447	11.9	1,654	2.7	3.6	5.2	0.4	3.9	6.4	72.1	5.7	1.4
Not specified . . . . .	3,576	-	3	-	-	-	-	0.1	-	7.1	92.8	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 6J. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: OTHER ROBOTS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	4.7	1.3	1.5	1.4	0.2	0.3	0.2
Major Group:								
34, Fabricated Metal Products.....	13,190	3.8	0.8	1.7	0.9	0.2	0.2	0.4
35, Industrial Machinery and Equipment.....	14,231	3.6	0.7	1.5	1.0	0.2	0.3	0.3
36, Electronic and Other Electric Equipment.....	7,472	5.3	1.7	1.2	1.9	0.2	0.4	0.4
37, Transportation Equipment.....	4,110	11.7	5.2	2.5	3.1	0.5	0.4	0.9
38, Instruments and Related Products.....	3,988	3.8	0.9	0.8	1.8	0.1	0.3	0.4
Employment size:								
20 to 99.....	30,502	1.3	0.3	0.6	0.3	0.1	0.1	0.2
100 to 499.....	10,321	9.5	2.5	3.3	2.6	0.3	0.7	0.5
500 and over.....	2,168	29.6	10.2	6.5	10.2	1.4	1.7	0.7
Age of plant (years):								
Less than 5.....	4,893	3.1	0.6	1.1	1.1	0.1	0.3	0.5
5 to 15.....	13,722	4.2	1.4	1.4	1.0	0.2	0.3	0.4
16 to 30.....	11,303	5.2	1.3	1.6	1.8	0.3	0.3	0.4
Over 30.....	9,310	7.7	2.2	2.5	2.2	0.4	0.4	0.5
Not specified.....	3,763	0.1	-	-	-	-	-	0.1
Manufacturing process:								
Fabrication/machining.....	6,795	1.9	0.2	0.9	0.5	0.1	0.2	0.5
Assembly.....	6,388	4.8	1.8	1.2	1.4	0.2	0.2	0.4
Both.....	23,393	6.6	1.7	2.2	2.0	0.3	0.4	0.3
Neither.....	2,577	1.9	1.1	0.2	0.2	-	0.4	0.6
Not specified.....	3,838	0.2	-	-	-	-	0.1	0.1
Market for most products:								
Consumer.....	4,358	7.3	2.2	1.5	3.0	0.2	0.4	0.7
Commercial.....	5,791	4.0	0.9	1.1	1.6	-	0.3	0.4
Industrial.....	18,796	3.5	0.8	1.6	0.8	0.1	0.2	0.3
Transportation.....	3,974	13.6	4.7	3.6	3.4	1.1	0.8	1.1
Government.....	2,141	4.9	2.3	0.7	1.4	0.3	0.2	0.5
Other.....	3,679	4.0	1.0	1.5	1.1	0.2	0.1	0.5
Not specified.....	4,252	0.8	0.1	0.2	0.3	-	0.2	0.2
Market price for most products:								
Less than \$5.....	5,274	4.4	1.2	1.6	1.1	0.3	0.3	0.6
\$5 to \$100.....	10,422	6.0	1.7	2.0	1.7	0.2	0.5	0.4
\$101 to \$1,000.....	8,846	5.6	1.4	1.9	1.8	0.3	0.2	0.6
\$1,001 to \$2,000.....	2,023	4.3	1.5	1.1	1.4	-	0.2	0.8
\$2,001 to \$10,000.....	4,265	3.5	1.0	1.5	0.7	0.1	0.2	0.4
Over \$10,000.....	7,340	5.5	1.9	1.4	1.6	0.3	0.3	0.4
Not specified.....	4,821	0.7	-	-	0.6	-	0.1	0.3
Products made to military specifications:								
Yes.....	14,112	5.3	1.5	1.9	1.6	0.2	0.2	0.4
No.....	22,214	5.2	1.4	1.6	1.5	0.2	0.4	0.3
Don't know.....	2,939	4.6	1.6	1.2	1.3	0.4	0.1	0.7
Not specified.....	3,726	0.1	-	-	0.1	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	5.6	1.4	2.1	1.6	0.2	0.3	0.5
26 to 75 percent.....	2,499	2.6	0.4	1.2	0.6	0.3	0.1	0.5
Over 75 percent.....	1,148	2.0	1.6	0.1	0.3	-	0.1	0.6
None.....	11,808	5.5	1.7	1.5	1.6	0.3	0.4	0.4
Don't know.....	13,573	5.3	1.4	1.8	1.7	0.2	0.3	0.4
Not specified.....	4,029	0.4	0.2	-	-	-	0.1	0.3

See footnotes at the end of the table.

Table 6J. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: OTHER ROBOTS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	2.9	0.8	1.0	0.8	0.1	0.1	0.3
Less than 10 percent .....	15,360	6.2	1.8	2.1	1.6	0.3	0.4	0.4
10 to 19 percent .....	4,737	7.8	2.2	1.9	2.7	0.4	0.7	0.7
20 to 49 percent .....	3,912	6.2	1.4	2.1	2.0	0.4	0.2	0.6
50 percent or more .....	1,398	4.3	1.3	0.7	1.2	0.4	0.7	0.9
Not specified .....	3,897	0.4	0.2	0.1	0.2	-	-	0.2
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	3.7	1.1	0.6	1.0	0.4	0.5	0.8
In this plant .....	25,416	4.5	1.2	1.7	1.1	0.2	0.3	0.3
Elsewhere in the firm .....	4,969	14.8	4.7	3.4	5.4	0.5	0.9	0.9
No research and development done ..	7,046	0.9	0.2	0.4	0.2	-	-	0.2
Not specified .....	3,726	0.3	-	-	0.1	-	0.2	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	5.1	1.3	1.7	1.5	0.2	0.3	0.2
Elsewhere in the firm .....	1,099	13.3	4.0	3.7	4.5	0.5	0.5	1.8
Outside the firm .....	3,506	7.3	2.8	2.1	1.3	0.4	0.7	0.9
No formal training for staff conducted ..	5,251	2.1	0.7	0.5	0.9	-	0.1	0.5
Not specified .....	3,686	0.1	-	-	0.1	-	0.1	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	4.6	1.2	1.6	1.3	0.2	0.2	0.3
Staff from outside the plant .....	1,637	13.4	3.3	3.6	5.3	0.7	0.5	1.4
Trainers from outside the firm .....	5,287	8.6	3.0	2.4	2.1	0.4	0.6	0.7
Not specified .....	9,115	1.4	0.4	0.3	0.6	-	0.2	0.3
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	4.2	1.6	1.2	1.1	0.3	0.1	0.4
Some problems .....	19,836	6.1	1.5	2.1	1.8	0.2	0.5	0.3
Very difficult .....	5,401	4.6	1.0	1.3	1.7	0.2	0.4	0.5
Not specified .....	3,849	-	-	-	-	-	-	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	12.3	3.4	3.4	3.7	0.6	1.1	1.0
No .....	34,703	4.2	1.2	1.4	1.1	0.2	0.2	0.2
Don't know .....	1,447	11.9	2.7	3.1	5.0	0.5	0.6	1.4
Not specified .....	3,576	-	-	-	-	-	-	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 7A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (AS/RS)

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	2.6	-	0.5	0.9	1.1	0.1	1.1	3.3	82.2	10.8	0.1
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	1.3	-	0.3	0.7	0.3	-	0.9	3.2	83.2	11.5	0.2
35, Industrial Machinery and Equipment . . . . .	14,231	2.4	-	0.6	0.5	1.1	0.2	0.9	2.4	84.6	9.9	0.3
36, Electronic and Other Electric Equipment. . . . .	7,472	3.8	-	0.6	1.6	1.5	0.1	1.7	4.2	79.0	11.3	0.3
37, Transportation Equipment . . . . .	4,110	3.8	-	0.6	1.0	2.1	0.1	0.8	3.9	80.4	11.1	0.3
38, Instruments and Related Products . . . . .	3,988	4.8	-	1.1	1.6	1.9	0.2	1.6	5.0	78.3	10.2	0.4
Employment size:												
20 to 99. . . . .	30,502	.5	-	0.2	0.2	0.1	-	0.4	2.1	85.0	11.8	0.2
100 to 499. . . . .	10,321	4.1	-	1.0	1.6	1.3	0.2	2.5	6.0	79.3	8.1	0.3
500 and over. . . . .	2,168	23.5	-	3.0	6.5	13.4	0.6	3.1	7.7	56.8	8.8	0.7
Age of plant (years):												
Less than 5. . . . .	4,893	2.4	-	0.7	1.4	0.2	0.1	1.5	4.6	87.8	3.7	0.7
5 to 15. . . . .	13,722	2.5	-	0.6	0.8	1.0	0.1	1.0	3.9	89.2	3.4	0.3
16 to 30. . . . .	11,303	2.4	-	0.5	0.8	1.0	0.1	1.0	3.1	89.8	3.5	0.2
Over 30. . . . .	9,310	4.0	-	0.6	1.1	2.2	0.1	1.3	3.5	88.1	3.1	0.3
Not specified. . . . .	3,763	-	-	-	-	-	-	0.3	-	11.8	87.8	0.1
Manufacturing process:												
Fabrication/machining. . . . .	6,795	2.0	-	0.6	0.8	0.6	-	0.6	2.5	91.2	3.6	0.6
Assembly. . . . .	6,388	4.5	-	0.6	2.0	1.8	0.1	1.8	5.0	85.9	2.7	0.4
Both. . . . .	23,393	2.8	-	0.6	0.8	1.3	0.1	1.0	3.7	89.4	3.0	0.2
Neither. . . . .	2,577	1.1	-	0.3	0.3	0.3	0.2	1.4	2.6	87.6	7.3	0.3
Not specified. . . . .	3,838	0.1	-	-	-	-	0.1	0.8	0.1	12.2	86.8	0.1
Market for most products:												
Consumer. . . . .	4,358	2.7	-	0.4	1.0	1.1	0.2	1.4	6.4	84.6	5.0	0.3
Commercial. . . . .	5,791	3.0	-	0.8	1.1	1.0	0.1	1.8	4.1	88.7	2.3	0.3
Industrial. . . . .	18,796	2.4	-	0.6	0.9	0.8	0.1	0.9	3.0	90.3	3.3	0.3
Transportation. . . . .	3,974	3.6	-	0.9	1.0	1.5	0.2	0.7	4.7	87.8	3.3	0.4
Government. . . . .	2,141	6.3	-	0.7	1.7	3.9	-	1.0	2.8	86.3	3.6	0.6
Other. . . . .	3,679	2.4	-	0.2	0.8	1.4	-	1.3	2.3	89.5	4.5	0.4
Not specified. . . . .	4,252	0.3	-	-	0.1	0.2	-	0.5	0.3	21.2	77.6	0.1
Market price for most products:												
Less than \$5. . . . .	5,274	2.2	-	0.8	0.8	0.5	0.1	1.4	4.6	88.0	3.9	0.5
\$5 to \$100. . . . .	10,422	1.8	-	0.4	0.5	0.8	0.1	1.5	5.0	87.8	3.8	0.2
\$101 to \$1,000. . . . .	8,846	2.9	-	0.6	1.3	0.9	0.1	0.7	3.4	90.4	2.6	0.5
\$1,001 to \$2,000. . . . .	2,023	3.8	-	0.3	2.4	1.1	-	1.6	2.6	89.9	2.1	0.9
\$2,001 to \$10,000. . . . .	4,265	2.6	-	0.5	0.8	1.2	0.1	1.1	2.7	91.0	2.6	0.3
Over \$10,000. . . . .	7,340	4.8	-	0.8	1.1	2.8	0.1	1.2	2.3	88.8	2.9	0.3
Not specified. . . . .	4,821	0.3	-	-	0.1	0.1	0.1	0.3	0.7	27.3	71.4	0.1
Products made to military specifications:												
Yes. . . . .	14,112	3.9	-	0.8	1.1	1.9	0.1	1.3	4.0	88.2	2.8	0.3
No. . . . .	22,214	2.3	-	0.4	1.0	0.8	0.1	1.1	3.6	89.2	3.8	0.2
Don't know. . . . .	2,939	2.4	-	1.0	0.4	1.0	-	0.9	2.7	90.5	3.4	0.9
Not specified. . . . .	3,726	0.2	-	0.1	0.1	-	-	0.1	-	10.9	88.7	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent. . . . .	9,934	4.0	-	0.6	1.2	2.1	0.1	1.6	4.2	87.8	2.4	0.4
26 to 75 percent. . . . .	2,499	3.7	-	0.6	1.5	1.6	-	1.1	2.4	91.0	1.6	0.7
Over 75 percent. . . . .	1,148	1.7	-	0.4	0.5	0.8	-	0.9	0.9	91.6	5.0	0.4
None. . . . .	11,808	2.0	-	0.3	0.8	0.7	0.2	1.0	3.4	90.2	3.4	0.2
Don't know. . . . .	13,573	2.7	-	0.8	0.9	0.9	0.1	1.1	3.8	88.6	3.9	0.3
Not specified. . . . .	4,029	0.3	-	0.1	0.1	0.1	-	0.1	0.7	15.2	83.6	0.1

See footnotes at the end of the table.



Table 7A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (AS/RS)—Continued**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	1.2	-	0.1	0.5	0.5	0.1	0.8	2.5	91.4	4.3	0.2
Less than 10 percent .....	15,360	2.8	-	0.5	1.0	1.3	-	1.2	4.0	89.1	2.9	0.2
10 to 19 percent .....	4,737	5.0	-	1.3	1.8	1.8	0.1	1.7	4.7	86.6	2.2	0.7
20 to 49 percent .....	3,912	5.6	-	1.7	1.6	1.9	0.4	1.7	5.1	85.0	2.6	0.6
50 percent or more .....	1,398	5.6	-	1.1	1.3	2.6	0.6	1.1	4.1	86.7	2.4	0.8
Not specified .....	3,897	0.3	-	0.1	0.1	0.1	-	0.1	0.2	12.9	86.5	0.1
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	3.1	-	1.6	0.7	0.5	0.3	0.2	2.7	92.0	2.1	1.0
In the plant .....	25,416	2.6	-	0.4	1.0	1.1	0.1	1.2	4.2	88.5	3.4	0.2
Elsewhere in the firm .....	4,969	6.8	-	1.6	2.3	2.8	0.1	2.5	5.2	82.8	2.8	0.7
No research and development done .....	7,046	0.8	-	0.2	0.1	0.5	-	0.3	0.6	94.8	3.5	0.4
Not specified .....	3,726	0.2	-	0.1	0.1	-	-	-	0.4	9.9	89.5	0.1
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	2.9	-	0.6	1.0	1.2	0.1	1.2	4.0	88.3	3.6	0.2
Elsewhere in the firm .....	1,099	7.7	-	0.8	3.8	2.9	0.2	4.9	4.5	80.7	2.1	1.1
Outside the firm .....	3,506	2.0	-	0.3	0.8	0.9	-	0.5	4.5	91.1	1.9	0.3
No formal training for staff .....	5,251	1.7	-	0.7	0.1	0.9	-	0.6	1.2	93.6	3.0	0.7
Not specified .....	3,686	0.1	-	-	0.1	-	-	0.2	0.1	9.4	90.2	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	2.8	-	0.6	1.0	1.1	0.1	1.0	3.8	88.6	3.8	0.2
Staff from outside the plant .....	1,637	7.5	-	0.7	3.5	3.2	0.1	4.7	5.6	80.7	1.4	0.9
Trainers from outside the firm .....	5,287	2.7	-	0.4	1.0	1.2	0.1	1.1	4.9	89.9	1.4	0.3
Not specified .....	9,115	1.2	-	0.4	0.1	0.6	0.1	0.5	0.7	59.0	38.7	0.4
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	2.8	-	0.5	0.8	1.5	-	1.2	3.4	89.2	3.4	0.3
Some problems .....	19,836	3.1	-	0.7	1.1	1.1	0.2	1.3	4.0	89.0	2.7	0.2
Very difficult .....	5,401	2.2	-	0.4	1.0	0.7	0.1	1.0	3.3	88.5	5.1	0.4
Not specified .....	3,849	0.2	-	-	-	0.2	-	-	-	12.8	87.0	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	6.6	-	2.2	2.3	1.8	0.3	2.0	5.9	82.9	2.7	1.0
No .....	34,703	2.3	-	0.4	0.8	1.0	0.1	1.0	3.3	90.0	3.4	0.1
Don't know .....	1,447	8.7	-	1.2	2.7	4.7	0.1	2.7	5.7	79.8	3.1	2.0
Not specified .....	3,576	0.2	-	-	0.1	0.1	-	-	-	7.0	92.8	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 7B. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (AS/RS)**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	2.6	0.3	1.0	0.7	0.5	0.1	0.1
Major Group:								
34, Fabricated Metal Products.....	13,190	1.2	0.2	0.6	0.2	0.2	-	0.2
35, Industrial Machinery and Equipment.....	14,231	2.3	0.1	0.8	0.6	0.6	0.1	0.3
36, Electronic and Other Electric Equipment.....	7,472	3.8	0.7	1.5	0.8	0.5	0.2	0.3
37, Transportation Equipment.....	4,110	3.8	0.2	1.1	1.9	0.5	0.1	0.3
38, Instruments and Related Products.....	3,988	4.8	0.8	1.9	1.1	0.6	0.5	0.4
Employment size:								
20 to 99.....	30,502	0.6	0.1	0.2	-	0.2	-	0.2
100 to 499.....	10,321	4.1	0.5	1.7	1.0	0.6	0.3	0.3
500 and over.....	2,168	23.6	2.7	8.5	8.0	3.2	1.2	0.7
Age of plant (years):								
Less than 5.....	4,893	2.5	0.4	0.9	0.4	0.7	0.1	0.7
5 to 15.....	13,722	2.5	0.3	1.0	0.5	0.6	0.1	0.3
16 to 30.....	11,303	2.5	0.3	1.1	0.6	0.5	0.1	0.2
Over 30.....	9,310	4.0	0.5	1.4	1.5	0.4	0.2	0.3
Not specified.....	3,763	-	-	-	-	-	-	0.1
Manufacturing process:								
Fabrication/machining.....	6,795	2.1	0.3	0.9	0.4	0.5	0.1	0.6
Assembly.....	6,388	4.5	0.6	1.9	1.1	0.7	0.2	0.4
Both.....	23,393	2.8	0.3	1.0	0.8	0.5	0.1	0.2
Neither.....	2,577	1.0	0.3	0.4	0.3	-	-	0.3
Not specified.....	3,838	0.1	-	-	-	-	0.1	0.1
Market for most products:								
Consumer.....	4,358	2.7	0.5	0.8	0.8	0.3	0.2	0.3
Commercial.....	5,791	3.0	0.5	1.3	0.7	0.4	0.2	0.3
Industrial.....	18,796	2.4	0.3	1.0	0.4	0.5	0.1	0.3
Transportation.....	3,974	3.5	0.2	0.8	1.5	0.8	0.2	0.4
Government.....	2,141	6.3	0.7	3.0	1.7	0.7	0.2	0.6
Other.....	3,679	2.5	0.1	0.8	0.9	0.6	0.1	0.4
Not specified.....	4,252	0.4	-	0.1	0.1	-	0.1	0.1
Market price for most products:								
Less than \$5.....	5,274	2.2	0.2	0.3	0.8	0.9	0.1	0.5
\$5 to \$100.....	10,422	1.9	0.3	0.8	0.4	0.2	0.1	0.2
\$101 to \$1,000.....	8,846	3.0	0.4	1.3	0.5	0.7	0.1	0.5
\$1,001 to \$2,000.....	2,023	3.8	0.8	0.8	0.7	1.0	0.4	0.9
\$2,001 to \$10,000.....	4,265	2.5	0.4	1.1	0.6	0.4	-	0.3
Over \$10,000.....	7,340	4.8	0.5	2.0	1.6	0.4	0.3	0.3
Not specified.....	4,821	0.3	-	0.1	0.1	-	0.1	0.1
Products made to military specifications:								
Yes.....	14,112	3.8	0.4	1.6	1.0	0.6	0.2	0.3
No.....	22,214	2.3	0.3	0.8	0.6	0.4	0.1	0.2
Don't know.....	2,939	2.5	0.2	0.3	0.6	1.4	-	0.9
Not specified.....	3,726	0.2	-	0.2	-	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	4.0	0.3	2.1	1.0	0.4	0.3	0.4
26 to 75 percent.....	2,499	3.9	1.2	1.1	1.1	0.4	0.1	0.7
Over 75 percent.....	1,148	1.7	0.3	0.2	0.5	0.6	0.1	0.4
None.....	11,808	1.9	0.3	0.8	0.4	0.4	0.1	0.2
Don't know.....	13,573	2.7	0.3	0.7	0.8	0.8	0.1	0.3
Not specified.....	4,029	0.3	0.1	0.1	-	-	-	0.1

See footnotes at the end of the table.

Table 7B. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (AS/RS)—Continued**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	1.1	0.2	0.4	0.3	0.1	0.1	0.2
Less than 10 percent .....	15,360	2.8	0.3	1.3	0.7	0.3	0.1	0.2
10 to 19 percent .....	4,737	4.9	0.4	2.0	1.1	1.2	0.2	0.7
20 to 49 percent .....	3,912	5.7	0.6	1.7	1.4	1.6	0.4	0.6
50 percent or more .....	1,398	5.7	1.4	1.5	1.3	0.9	0.5	0.8
Not specified .....	3,897	0.3	0.1	-	0.1	0.1	-	0.1
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	3.1	0.7	0.4	0.5	1.1	0.4	1.0
In this plant .....	25,416	2.6	0.3	1.1	0.7	0.4	0.1	0.2
Elsewhere in the firm .....	4,969	6.7	0.7	2.1	2.0	1.6	0.3	0.7
No research and development done ..	7,046	0.7	0.1	0.4	0.2	0.1	-	0.4
Not specified .....	3,726	0.2	-	0.1	-	-	0.1	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	3.0	0.4	1.1	0.8	0.5	0.2	0.2
Elsewhere in the firm .....	1,099	7.6	0.8	2.3	3.3	1.3	-	1.1
Outside the firm .....	3,506	2.0	0.3	0.7	0.6	0.5	-	0.3
No formal training for staff conducted .....	5,251	1.7	-	0.9	0.1	0.6	0.1	0.7
Not specified .....	3,686	0.1	-	-	0.1	-	-	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	2.8	0.4	1.1	0.7	0.5	0.1	0.2
Staff from outside the plant .....	1,637	7.6	0.7	3.0	2.3	1.3	0.2	0.9
Trainers from outside the firm .....	5,287	2.7	0.4	0.9	0.8	0.5	0.2	0.3
Not specified .....	9,115	1.1	-	0.5	0.1	0.4	0.1	0.4
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	2.8	0.3	1.3	0.6	0.5	0.1	0.3
Some problems .....	19,836	3.1	0.3	1.0	0.9	0.6	0.2	0.2
Very difficult .....	5,401	2.1	0.6	0.8	0.4	0.3	0.1	0.4
Not specified .....	3,849	0.2	-	0.1	-	0.1	-	0.1
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	6.5	0.6	1.4	2.1	1.8	0.6	1.0
No .....	34,703	2.2	0.3	1.0	0.5	0.3	0.1	0.1
Don't know .....	1,447	8.7	0.5	3.8	2.1	2.3	-	2.0
Not specified .....	3,576	0.1	-	-	0.1	-	0.1	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 7C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATIC GUIDED VEHICLE SYSTEMS (AGVS)

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments . . . . .	42,991	1.2	-	0.2	0.4	0.5	0.1	0.6	1.5	85.9	11.0	0.1
Major Group:												
34, Fabricated Metal Products.	13,190	0.4	-	0.1	0.2	0.1	-	0.5	1.3	86.1	11.8	0.1
35, Industrial Machinery and Equipment . . . . .	14,231	1.1	-	0.1	0.3	0.5	0.2	0.5	1.0	87.3	10.1	0.1
36, Electronic and Other Electric Equipment . . . . .	7,472	1.6	-	0.3	0.7	0.6	-	0.7	2.4	83.9	11.3	0.2
37, Transportation Equipment . . . . .	4,110	2.2	-	0.3	0.6	1.3	-	1.0	2.3	83.4	11.1	0.3
38, Instruments and Related Products . . . . .	3,988	1.5	-	0.2	0.6	0.7	-	0.4	1.6	86.1	10.5	0.3
Employment size:												
20 to 99 . . . . .	30,502	0.3	-	-	0.1	0.1	0.1	0.3	0.7	86.7	12.0	0.1
100 to 499 . . . . .	10,321	1.3	-	0.3	0.5	0.4	0.1	1.1	2.8	86.4	8.4	0.2
500 and over . . . . .	2,168	11.9	-	1.3	4.1	6.1	0.4	1.8	6.3	71.1	9.0	0.6
Age of plant (years):												
Less than 5 . . . . .	4,893	0.4	-	0.1	0.2	-	0.1	0.2	2.0	93.5	3.8	0.1
5 to 15 . . . . .	13,722	1.0	-	0.1	0.4	0.4	0.1	0.9	1.5	93.2	3.5	0.1
16 to 30 . . . . .	11,303	1.4	-	0.2	0.5	0.6	0.1	0.6	1.5	92.7	3.8	0.2
Over 30 . . . . .	9,310	1.7	-	0.2	0.6	0.9	-	0.4	1.9	92.7	3.4	0.1
Not specified . . . . .	3,763	-	-	-	-	-	-	0.2	-	12.0	87.9	0.1
Manufacturing process:												
Fabrication/machining . . . . .	6,795	0.5	-	0.1	0.2	0.2	-	0.3	1.6	94.0	3.5	0.2
Assembly . . . . .	6,388	1.7	-	0.3	0.7	0.7	-	0.9	2.3	92.3	2.7	0.2
Both . . . . .	23,393	1.3	-	0.2	0.4	0.6	0.1	0.6	1.5	93.4	3.2	0.1
Neither . . . . .	2,577	0.7	-	0.2	0.2	0.3	-	0.4	1.7	89.0	8.2	0.2
Not specified . . . . .	3,838	0.2	-	-	0.1	-	0.1	0.3	-	12.7	86.8	0.1
Market for most products:												
Consumer . . . . .	4,358	2.1	-	0.4	0.7	1.0	-	1.5	2.5	88.8	5.0	0.2
Commercial . . . . .	5,791	1.3	-	0.3	0.5	0.4	0.1	0.6	1.8	93.8	2.4	0.2
Industrial . . . . .	18,796	0.6	-	0.1	0.2	0.2	0.1	0.3	1.3	94.4	3.3	0.1
Transportation . . . . .	3,974	2.8	-	0.6	0.8	1.3	0.1	0.8	3.0	90.1	3.1	0.4
Government . . . . .	2,141	0.9	-	-	0.2	0.7	-	0.5	1.4	93.2	4.0	0.2
Other . . . . .	3,679	0.9	-	-	0.5	0.4	-	0.7	1.0	92.7	4.8	0.2
Not specified . . . . .	4,252	0.3	-	-	0.2	0.1	-	0.2	-	20.7	78.7	0.2
Market price for most products:												
Less than \$5 . . . . .	5,274	1.4	-	0.2	0.7	0.5	-	0.5	1.3	92.7	4.0	0.3
\$5 to \$100 . . . . .	10,422	1.1	-	0.2	0.4	0.4	0.1	0.5	2.7	91.9	3.8	0.1
\$101 to \$1,000 . . . . .	8,846	0.8	-	0.1	0.4	0.3	-	0.8	1.7	93.9	2.8	0.1
\$1,001 to \$2,000 . . . . .	2,023	1.0	-	0.1	0.2	0.7	-	0.8	0.7	95.2	2.3	0.3
\$2,001 to \$10,000 . . . . .	4,265	1.2	-	0.3	0.3	0.4	0.2	0.2	1.3	94.1	3.2	0.3
Over \$10,000 . . . . .	7,340	1.8	-	0.1	0.6	1.0	0.1	0.8	1.0	93.3	3.1	0.2
Not specified . . . . .	4,821	0.1	-	-	-	-	0.1	0.2	0.1	28.3	71.2	0.1
Products made to military specifications:												
Yes . . . . .	14,112	1.0	-	0.2	0.3	0.5	-	0.6	2.0	93.4	2.9	0.1
No . . . . .	22,214	1.3	-	0.2	0.5	0.5	0.1	0.7	1.5	92.7	3.9	0.1
Don't know . . . . .	2,939	1.5	-	0.1	0.5	0.6	0.3	0.2	1.0	92.9	4.5	0.5
Not specified . . . . .	3,726	-	-	-	-	-	-	-	0.1	11.2	88.7	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	1.1	-	0.2	0.3	0.6	-	1.2	2.3	93.0	2.4	0.1
26 to 75 percent . . . . .	2,499	0.3	-	-	0.1	0.2	-	0.2	0.8	96.5	2.0	0.1
Over 75 percent . . . . .	1,148	0.6	-	0.2	0.1	0.3	-	0.3	0.5	93.6	5.0	0.3
None . . . . .	11,808	1.4	-	0.2	0.5	0.5	0.2	0.4	1.5	93.0	3.6	0.2
Don't know . . . . .	13,573	1.3	-	0.2	0.5	0.5	0.1	0.5	1.6	92.5	4.1	0.1
Not specified . . . . .	4,029	-	-	-	-	-	-	-	-	16.2	83.7	0.1

See footnotes at the end of the table.

Table 7C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATIC GUIDED VEHICLE SYSTEMS (AGVS)—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	0.2	-	-	0.1	0.1	-	0.5	1.0	93.8	4.4	0.1
Less than 10 percent .....	15,360	1.4	-	0.2	0.5	0.6	0.1	0.6	1.9	92.8	3.2	0.2
10 to 19 percent .....	4,737	2.1	-	0.2	0.8	1.0	0.1	1.0	2.4	92.2	2.4	0.2
20 to 49 percent .....	3,912	2.0	-	0.3	0.6	0.9	0.2	0.6	1.7	93.0	2.7	0.3
50 percent or more .....	1,398	2.5	-	0.2	0.9	1.0	0.4	0.5	2.3	91.8	2.8	0.5
Not specified .....	3,897	0.1	-	-	-	0.1	-	0.1	0.1	13.8	86.0	0.1
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	1.0	-	0.1	0.3	0.3	0.3	0.4	1.5	94.8	2.3	0.2
In the plant .....	25,416	1.1	-	0.2	0.4	0.4	0.1	0.5	1.6	93.2	3.7	0.1
Elsewhere in the firm .....	4,969	3.8	-	0.5	1.2	2.0	0.1	2.2	3.7	87.4	3.1	0.4
No research and development done .....	7,046	0.1	-	-	0.1	-	-	0.1	0.2	96.4	3.2	0.1
Not specified .....	3,726	0.2	-	-	0.1	0.1	-	-	0.3	10.0	89.5	0.1
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	1.2	-	0.2	0.4	0.5	0.1	0.7	1.8	92.3	3.8	0.1
Elsewhere in the firm .....	1,099	3.6	-	0.8	1.7	1.1	-	0.7	2.3	91.4	1.9	0.7
Outside the firm .....	3,506	0.9	-	-	0.4	0.5	-	0.3	2.1	94.8	1.9	0.2
No formal training for staff .....	5,251	0.2	-	-	-	0.2	-	0.1	0.3	96.1	3.3	0.1
Not specified .....	3,686	0.2	-	-	0.1	0.1	-	0.2	-	9.4	90.2	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	1.1	-	0.1	0.4	0.5	0.1	0.6	1.7	92.6	4.0	0.1
Staff from outside the plant .....	1,637	3.7	-	0.8	1.5	1.3	0.1	1.8	3.1	89.8	1.6	0.6
Trainers from outside the firm .....	5,287	1.3	-	0.2	0.5	0.5	0.1	0.6	2.4	94.2	1.5	0.2
Not specified .....	9,115	0.2	-	-	-	0.1	0.1	0.1	0.3	60.5	38.8	0.1
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	0.9	-	0.1	0.3	0.5	-	0.7	1.4	93.6	3.4	0.1
Some problems .....	19,836	1.5	-	0.2	0.6	0.6	0.1	0.5	1.9	93.1	3.0	0.1
Very difficult .....	5,401	0.6	-	0.1	0.1	0.4	-	0.6	1.5	91.9	5.5	0.1
Not specified .....	3,849	0.3	-	-	-	0.1	0.2	-	-	12.5	87.1	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	3.9	-	0.7	1.9	1.1	0.2	1.0	3.6	88.9	2.7	0.5
No .....	34,703	0.9	-	0.1	0.3	0.4	0.1	0.6	1.4	93.5	3.6	0.1
Don't know .....	1,447	3.3	-	0.9	0.4	1.9	0.1	1.2	2.3	89.9	3.2	0.8
Not specified .....	3,576	-	-	-	-	-	-	-	0.1	7.2	92.8	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 7D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATIC GUIDED VEHICLE SYSTEMS (AGVS)**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments .....	42,991	1.1	0.1	0.3	0.4	0.2	0.1	0.1
Major Group:								
34, Fabricated Metal Products .....	13,190	0.3	-	0.1	0.2	0.1	-	0.1
35, Industrial Machinery and Equipment .....	14,231	1.1	0.1	0.3	0.3	0.1	0.2	0.1
36, Electronic and Other Electric Equipment .....	7,472	1.7	0.1	0.6	0.5	0.3	0.1	0.2
37, Transportation Equipment .....	4,110	2.2	0.3	0.3	1.1	0.4	-	0.3
38, Instruments and Related Products .....	3,988	1.5	0.2	0.5	0.7	0.1	0.1	0.3
Employment size:								
20 to 99 .....	30,502	0.3	-	0.1	-	0.1	-	0.1
100 to 499 .....	10,321	1.3	-	0.5	0.3	0.2	0.2	0.2
500 and over .....	2,168	11.8	1.2	2.8	6.0	1.1	0.8	0.6
Age of plant (years):								
Less than 5 .....	4,893	0.5	-	0.2	0.2	-	0.1	0.1
5 to 15 .....	13,722	1.0	0.1	0.2	0.2	0.2	0.2	0.1
16 to 30 .....	11,303	1.4	-	0.5	0.4	0.4	-	0.2
Over 30 .....	9,310	1.7	0.2	0.3	0.9	0.1	0.1	0.1
Not specified .....	3,763	-	-	-	-	-	-	0.1
Manufacturing process:								
Fabrication/machining .....	6,795	0.6	-	0.2	0.3	0.1	-	0.2
Assembly .....	6,388	1.8	0.3	0.4	0.7	0.2	0.1	0.2
Both .....	23,393	1.3	0.1	0.4	0.5	0.2	0.1	0.1
Neither .....	2,577	0.6	-	0.2	0.2	0.2	-	0.2
Not specified .....	3,838	0.2	-	-	0.1	-	0.1	0.1
Market for most products:								
Consumer .....	4,358	2.1	0.1	0.6	1.0	0.3	-	0.2
Commercial .....	5,791	1.3	0.1	0.5	0.4	0.2	0.2	0.2
Industrial .....	18,796	0.7	-	0.2	0.2	0.1	0.1	0.1
Transportation .....	3,974	2.9	0.3	0.7	1.2	0.6	0.1	0.4
Government .....	2,141	0.9	-	0.3	0.5	-	-	0.2
Other .....	3,679	0.8	0.1	0.1	0.4	0.3	0.1	0.2
Not specified .....	4,252	0.3	0.2	-	0.1	-	-	0.2
Market price for most products:								
Less than \$5 .....	5,274	1.4	0.2	0.5	0.3	0.3	-	0.3
\$5 to \$100 .....	10,422	1.1	-	0.4	0.3	0.3	-	0.1
\$101 to \$1,000 .....	8,846	0.8	-	0.1	0.4	0.1	0.1	0.1
\$1,001 to \$2,000 .....	2,023	1.0	-	0.2	0.6	-	0.1	0.3
\$2,001 to \$10,000 .....	4,265	1.2	0.1	0.3	0.4	0.1	0.3	0.3
Over \$10,000 .....	7,340	1.9	0.3	0.4	0.7	0.2	0.2	0.2
Not specified .....	4,821	0.2	-	-	0.1	-	0.1	0.1
Products made to military specifications:								
Yes .....	14,112	1.0	0.1	0.3	0.5	0.1	0.1	0.1
No .....	22,214	1.3	0.1	0.4	0.4	0.2	0.1	0.1
Don't know .....	2,939	1.5	0.2	0.1	0.4	0.3	0.5	0.5
Not specified .....	3,726	-	-	-	-	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent .....	9,934	1.1	0.1	0.4	0.5	-	0.1	0.1
26 to 75 percent .....	2,499	0.4	-	0.1	0.3	-	-	0.1
Over 75 percent .....	1,148	0.6	-	0.5	0.1	-	-	0.3
None .....	11,808	1.4	0.1	0.4	0.3	0.4	0.2	0.2
Don't know .....	13,573	1.3	0.2	0.2	0.5	0.2	0.1	0.1
Not specified .....	4,029	-	-	-	-	-	-	0.1

See footnotes at the end of the table.



Table 7D. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATIC GUIDED VEHICLE SYSTEMS (AGVS)—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	0.3	-	0.1	0.1	0.1	-	0.1
Less than 10 percent .....	15,360	1.4	0.2	0.4	0.6	0.2	0.1	0.2
10 to 19 percent .....	4,737	2.0	0.1	0.4	1.0	0.3	0.2	0.2
20 to 49 percent .....	3,912	2.0	0.2	0.9	0.5	0.3	0.2	0.3
50 percent or more .....	1,398	2.5	0.1	1.0	0.6	0.2	0.6	0.5
Not specified .....	3,897	0.1	-	-	-	0.1	-	0.1
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	0.9	0.1	0.1	0.4	-	0.3	0.2
In this plant .....	25,416	1.0	0.1	0.3	0.3	0.2	0.1	0.1
Elsewhere in the firm .....	4,969	3.7	0.3	0.9	1.8	0.5	0.2	0.4
No research and development done ..	7,046	0.1	-	-	-	0.1	-	0.1
Not specified .....	3,726	0.2	-	-	0.1	0.1	0.1	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	1.3	0.1	0.4	0.4	0.2	0.1	0.1
Elsewhere in the firm .....	1,099	3.6	0.5	1.0	2.2	-	-	0.7
Outside the firm .....	3,506	0.9	0.1	0.3	0.4	-	0.1	0.2
No formal training for staff conducted ..	5,251	0.2	-	-	0.1	-	-	0.1
Not specified .....	3,686	0.2	-	-	0.1	0.1	-	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	1.2	0.1	0.3	0.4	0.2	0.1	0.1
Staff from outside the plant .....	1,637	3.8	0.3	1.1	1.9	0.4	0.1	0.6
Trainers from outside the firm .....	5,287	1.4	-	0.4	0.5	0.1	0.3	0.2
Not specified .....	9,115	0.2	-	-	0.1	0.1	0.1	0.1
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	1.0	-	0.3	0.4	0.2	-	0.1
Some problems .....	19,836	1.5	0.2	0.4	0.6	0.2	0.2	0.1
Very difficult .....	5,401	0.5	-	0.2	0.3	-	-	0.1
Not specified .....	3,849	0.4	-	-	-	0.1	0.2	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	3.9	0.2	1.7	1.2	0.4	0.4	0.5
No .....	34,703	0.9	0.1	0.2	0.4	0.2	0.1	0.1
Don't know .....	1,447	3.3	0.1	1.6	1.0	0.5	0.1	0.8
Not specified .....	3,576	-	-	-	-	-	-	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 8A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON INCOMING OR IN-PROCESS MATERIALS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations", (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	9.9	-	2.4	3.5	3.6	0.4	3.6	6.1	69.6	10.9	0.4
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	8.0	-	2.1	2.9	2.6	0.4	3.3	5.8	71.4	11.3	0.7
35, Industrial Machinery and Equipment . . . . .	14,231	8.2	-	2.0	2.7	3.3	0.2	3.2	5.4	73.2	10.1	0.7
36, Electronic and Other Electric Equipment. . . . .	7,472	11.7	-	2.5	4.6	4.0	0.6	4.7	7.7	63.8	12.0	0.7
37, Transportation Equipment . . . . .	4,110	15.5	-	3.2	5.4	6.3	0.6	3.5	5.4	64.7	10.8	1.0
38, Instruments and Related Products. . . . .	3,988	11.8	-	3.4	3.7	4.4	0.3	3.7	7.2	66.7	10.7	0.8
Employment size:												
20 to 99. . . . .	30,502	5.5	-	1.5	2.0	1.7	0.3	2.9	5.5	74.2	11.9	0.5
100 to 499. . . . .	10,321	16.4	-	4.3	5.9	5.6	0.6	5.5	7.9	61.9	8.3	0.6
500 and over. . . . .	2,168	39.1	-	5.3	12.1	20.9	0.8	4.3	6.3	41.1	9.2	0.8
Age of plant (years):												
Less than 5. . . . .	4,893	7.9	-	3.1	3.3	1.2	0.3	4.5	7.6	75.3	4.6	1.0
5 to 15. . . . .	13,722	9.9	-	2.2	3.9	3.3	0.5	4.3	6.4	75.8	3.6	0.7
16 to 30. . . . .	11,303	10.6	-	3.0	2.9	4.3	0.4	3.5	7.1	75.3	3.5	0.8
Over 30. . . . .	9,310	13.5	-	2.3	4.8	6.0	0.4	3.4	5.7	74.2	3.2	0.8
Not specified. . . . .	3,763	0.5	-	0.1	0.4	-	-	0.3	0.9	10.8	87.6	0.4
Manufacturing process:												
Fabrication/machining. . . . .	6,795	10.1	-	3.0	3.8	2.9	0.4	3.5	6.1	77.0	3.4	1.1
Assembly. . . . .	6,388	10.8	-	2.4	4.3	3.8	0.3	3.6	7.7	74.8	3.1	0.8
Both. . . . .	23,393	11.1	-	2.6	3.6	4.5	0.4	4.1	7.0	74.5	3.3	0.5
Neither. . . . .	2,577	9.2	-	1.5	4.0	2.7	1.0	3.3	3.0	78.3	6.1	1.8
Not specified. . . . .	3,838	0.3	-	0.1	0.2	-	-	0.5	0.1	12.2	86.9	0.1
Market for most products:												
Consumer. . . . .	4,358	9.7	-	2.2	3.7	3.4	0.4	4.2	6.9	73.6	5.5	0.8
Commercial. . . . .	5,791	10.3	-	3.0	3.8	3.0	0.5	4.7	7.8	74.4	2.9	1.0
Industrial. . . . .	18,796	8.9	-	2.3	2.9	3.4	0.3	3.1	6.3	78.2	3.4	0.6
Transportation. . . . .	3,974	17.7	-	3.2	7.4	6.5	0.6	4.0	7.6	67.8	2.7	1.3
Government. . . . .	2,141	16.1	-	3.7	4.7	7.5	0.2	6.2	6.7	67.7	3.4	1.8
Other. . . . .	3,679	10.1	-	2.0	3.4	4.2	0.5	4.6	5.7	75.9	3.8	1.2
Not specified. . . . .	4,252	2.5	-	0.7	0.9	0.6	0.3	0.8	0.3	18.2	78.2	0.6
Market price for most products:												
Less than \$5. . . . .	5,274	14.8	-	4.2	4.9	5.1	0.6	6.2	7.6	67.5	4.0	1.2
\$5 to \$100. . . . .	10,422	10.4	-	2.2	4.0	3.8	0.4	3.5	9.1	73.2	3.7	0.8
\$101 to \$1,000. . . . .	8,846	10.2	-	2.3	3.6	4.0	0.3	4.1	5.4	77.3	2.9	0.9
\$1,001 to \$2,000. . . . .	2,023	10.5	-	2.2	5.4	2.4	0.5	4.1	4.0	78.4	3.1	1.7
\$2,001 to \$10,000. . . . .	4,265	7.9	-	2.4	2.9	2.6	-	3.4	7.0	78.1	3.4	1.0
Over \$10,000. . . . .	7,340	10.8	-	2.7	3.0	4.8	0.3	3.1	4.9	78.4	2.9	0.9
Not specified. . . . .	4,821	2.2	-	0.3	0.9	0.4	0.6	0.7	0.9	25.2	71.0	0.6
Products made to military specifications:												
Yes. . . . .	14,112	14.7	-	3.3	5.1	5.7	0.6	5.1	9.4	67.4	3.5	0.8
No. . . . .	22,214	9.0	-	2.3	3.3	3.1	0.3	3.5	4.9	79.0	3.7	0.5
Don't know. . . . .	2,939	6.2	-	1.6	1.9	2.0	0.7	1.1	6.1	84.0	2.6	1.1
Not specified. . . . .	3,726	0.2	-	0.1	-	0.1	-	0.1	0.2	10.7	88.9	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent. . . . .	9,934	14.7	-	3.2	5.0	5.9	0.6	5.3	8.5	68.6	2.9	1.0
26 to 75 percent. . . . .	2,498	13.3	-	4.0	4.1	5.0	0.2	4.6	11.0	67.9	3.2	1.8
Over 75 percent. . . . .	1,148	15.2	-	5.1	6.2	3.9	-	7.4	5.1	67.0	5.4	3.3
None. . . . .	11,808	7.8	-	1.7	3.2	2.6	0.3	2.6	4.5	81.7	3.4	0.6
Don't know. . . . .	13,573	9.7	-	2.4	3.3	3.6	0.4	3.5	6.4	76.7	3.6	0.6
Not specified. . . . .	4,029	0.5	-	0.2	0.1	0.2	-	0.4	0.8	14.4	83.8	0.1

See footnotes at the end of the table.

Table 8A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON INCOMING OR IN-PROCESS MATERIALS**—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	8.1	-	1.9	2.9	2.9	0.4	2.7	4.4	80.5	4.2	0.8
Less than 10 percent .....	15,360	11.3	-	2.7	4.0	4.2	0.4	5.1	8.0	72.4	3.1	0.6
10 to 19 percent .....	4,737	12.6	-	3.0	4.4	4.7	0.5	3.2	8.9	72.9	2.4	1.0
20 to 49 percent .....	3,912	13.6	-	3.4	4.8	4.9	0.5	3.9	7.0	72.3	3.1	1.0
50 percent or more .....	1,398	13.8	-	3.2	4.4	6.0	0.2	2.4	4.6	76.0	3.2	1.9
Not specified .....	3,897	1.2	-	0.3	0.6	0.3	-	0.9	0.5	11.2	86.3	0.4
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	9.3	-	3.4	3.9	1.9	0.1	4.0	5.2	79.1	2.3	2.1
In the plant .....	25,416	10.3	-	2.5	3.4	4.0	0.4	4.4	7.8	73.7	3.9	0.5
Elsewhere in the firm .....	4,969	20.6	-	4.3	7.4	7.8	1.1	5.0	6.9	65.2	2.3	1.2
No research and development done .....	7,046	5.8	-	1.3	2.7	1.7	0.1	1.4	2.7	87.0	3.1	1.0
Not specified .....	3,726	0.3	-	-	0.2	0.1	-	0.1	0.1	9.8	89.7	0.1
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	11.4	-	2.8	4.0	4.1	0.5	3.8	6.6	74.3	3.9	0.5
Elsewhere in the firm .....	1,099	17.6	-	2.5	6.1	8.6	0.4	7.8	7.8	65.4	1.4	2.0
Outside the firm .....	3,506	12.5	-	2.8	5.6	3.9	0.2	4.8	10.6	70.1	2.0	1.4
No formal training for staff .....	5,251	4.4	-	1.4	1.0	1.9	0.1	3.1	3.7	86.4	2.4	1.0
Not specified .....	3,686	0.5	-	-	0.1	0.3	0.1	0.2	0.5	8.5	90.4	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	10.9	-	2.6	3.7	4.1	0.5	3.3	6.6	75.3	4.0	0.5
Staff from outside the plant .....	1,637	18.1	-	3.1	6.9	7.8	0.3	10.3	7.3	63.1	1.2	1.8
Trainers from outside the firm .....	5,287	13.7	-	3.3	5.7	4.4	0.3	5.4	10.2	68.9	1.8	1.1
Not specified .....	9,115	2.9	-	0.8	1.0	1.0	0.1	2.1	2.0	54.3	38.6	0.5
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	7.8	-	2.3	2.7	2.6	0.2	3.0	5.5	80.2	3.4	0.6
Some problems .....	19,836	12.0	-	2.7	4.2	4.6	0.5	4.1	8.0	73.0	3.0	0.6
Very difficult .....	5,401	13.3	-	2.6	5.1	5.1	0.5	5.6	4.8	71.2	5.2	1.3
Not specified .....	3,849	0.6	-	0.3	0.2	0.1	-	0.3	0.3	11.7	87.2	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	17.7	-	4.8	5.9	6.3	0.7	4.8	9.7	65.1	2.8	1.3
No .....	34,703	9.7	-	2.3	3.5	3.6	0.3	3.8	6.3	76.6	3.6	0.4
Don't know .....	1,447	19.9	-	4.0	6.8	7.0	2.1	4.9	7.0	66.0	2.2	2.1
Not specified .....	3,576	0.1	-	0.1	-	-	-	0.1	-	6.9	92.9	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 8B. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON INCOMING OR IN-PROCESS MATERIALS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	9.8	7.7	0.8	0.4	0.3	0.6	0.4
Major Group:								
34, Fabricated Metal Products.....	13,190	8.1	6.6	0.5	0.2	0.4	0.4	0.7
35, Industrial Machinery and Equipment.....	14,231	8.1	6.8	0.5	0.2	0.3	0.3	0.7
36, Electronic and Other Electric Equipment.....	7,472	11.8	8.6	1.0	0.8	0.1	1.2	0.7
37, Transportation Equipment.....	4,110	15.6	11.8	1.4	0.7	0.4	1.3	1.0
38, Instruments and Related Products.....	3,988	11.7	8.4	1.6	0.7	0.2	0.8	0.8
Employment size:								
20 to 99.....	30,502	5.5	4.5	0.3	0.1	0.2	0.3	0.5
100 to 499.....	10,321	16.3	12.5	1.5	0.8	0.4	1.1	0.6
500 and over.....	2,168	39.1	29.3	3.9	2.6	1.0	2.4	0.8
Age of plant (years):								
Less than 5.....	4,893	8.0	6.2	0.4	0.1	0.2	0.9	1.0
5 to 15.....	13,722	9.9	8.0	0.7	0.4	0.1	0.7	0.7
16 to 30.....	11,303	10.6	8.1	1.2	0.4	0.5	0.5	0.8
Over 30.....	9,310	13.6	10.8	1.0	0.7	0.3	0.8	0.8
Not specified.....	3,763	0.5	-	0.1	-	0.4	-	0.4
Manufacturing process:								
Fabrication/machining.....	6,795	10.0	7.7	0.9	0.3	0.5	0.6	1.1
Assembly.....	6,388	10.8	8.3	1.0	0.7	-	0.8	0.8
Both.....	23,393	11.1	8.9	0.9	0.5	0.3	0.6	0.5
Neither.....	2,577	9.2	6.8	0.7	-	0.7	1.2	1.8
Not specified.....	3,838	0.3	0.1	0.1	-	-	0.1	0.1
Market for most products:								
Consumer.....	4,358	9.8	7.6	0.8	0.6	0.1	0.8	0.8
Commercial.....	5,791	10.2	7.7	1.0	0.5	0.1	0.8	1.0
Industrial.....	18,796	8.9	7.4	0.7	0.3	0.3	0.3	0.6
Transportation.....	3,974	17.8	14.3	1.5	0.5	0.4	1.0	1.3
Government.....	2,141	15.9	12.1	1.4	0.9	0.5	1.1	1.8
Other.....	3,679	10.1	7.0	0.9	0.4	1.1	0.7	1.2
Not specified.....	4,252	2.5	1.2	0.3	0.1	-	0.9	0.6
Market price for most products:								
Less than \$5.....	5,274	14.8	12.2	1.1	0.5	0.2	1.0	1.2
\$5 to \$100.....	10,422	10.5	8.2	0.6	0.5	0.6	0.5	0.8
\$101 to \$1,000.....	8,846	10.3	8.0	1.1	0.4	0.1	0.7	0.9
\$1,001 to \$2,000.....	2,023	10.5	7.3	1.3	0.6	0.7	0.6	1.7
\$2,001 to \$10,000.....	4,265	7.9	6.1	1.0	0.3	-	0.5	1.0
Over \$10,000.....	7,340	10.7	8.9	0.7	0.4	0.2	0.4	0.9
Not specified.....	4,821	2.2	1.0	0.1	-	0.3	0.7	0.6
Products made to military specifications:								
Yes.....	14,112	14.6	11.1	1.4	0.7	0.4	0.9	0.8
No.....	22,214	8.9	7.3	0.6	0.3	0.2	0.5	0.5
Don't know.....	2,939	6.2	4.4	0.1	0.1	0.5	1.1	1.1
Not specified.....	3,726	0.2	0.1	0.1	-	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	14.6	11.7	1.1	0.5	0.3	1.0	1.0
26 to 75 percent.....	2,499	13.4	10.6	0.7	1.0	0.4	0.7	1.8
Over 75 percent.....	1,148	15.2	9.5	3.9	0.9	0.5	0.4	3.3
None.....	11,808	7.8	6.1	0.7	0.2	0.3	0.5	0.6
Don't know.....	13,573	9.7	7.7	0.7	0.5	0.2	0.6	0.6
Not specified.....	4,029	0.5	0.4	-	-	-	0.1	0.1

See footnotes at the end of the table.

Table 8B. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON INCOMING OR IN-PROCESS MATERIALS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	8.1	6.8	0.7	0.1	0.1	0.4	0.8
Less than 10 percent .....	15,360	11.3	9.1	0.9	0.5	0.2	0.7	0.6
10 to 19 percent .....	4,737	12.6	9.8	0.8	0.6	0.3	1.1	1.0
20 to 49 percent .....	3,912	13.7	9.2	1.6	1.2	0.4	1.3	1.0
50 percent or more .....	1,398	13.8	9.9	0.8	0.4	2.3	0.5	1.9
Not specified .....	3,897	1.2	0.6	-	-	0.5	-	0.4
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	9.4	8.0	0.4	0.3	0.2	0.5	2.1
In this plant .....	25,416	10.2	7.8	1.0	0.4	0.3	0.6	0.5
Elsewhere in the firm .....	4,969	20.6	16.2	1.5	1.0	0.3	1.8	1.2
No research and development done ..	7,046	5.8	5.2	0.2	0.1	0.3	0.1	1.0
Not specified .....	3,726	0.3	0.1	-	-	-	0.2	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	11.3	8.9	0.9	0.5	0.3	0.8	0.5
Elsewhere in the firm .....	1,099	17.6	14.4	1.2	0.6	0.2	1.2	2.0
Outside the firm .....	3,506	12.5	9.6	1.8	0.5	0.2	0.5	1.4
No formal training for staff conducted .....	5,251	4.4	3.5	0.3	0.3	0.3	-	1.0
Not specified .....	3,686	0.4	0.3	-	-	-	0.1	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	10.9	8.6	0.8	0.4	0.3	0.7	0.5
Staff from outside the plant .....	1,637	18.1	15.0	0.9	0.8	0.4	1.0	1.8
Trainers from outside the firm .....	5,287	13.7	10.3	1.8	0.7	0.2	0.8	1.1
Not specified .....	9,115	3.0	2.1	0.2	0.2	0.2	0.2	0.5
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	7.9	6.2	0.5	0.3	0.4	0.5	0.6
Some problems .....	19,836	12.0	9.5	1.0	0.4	0.3	0.8	0.6
Very difficult .....	5,401	13.2	10.1	1.4	0.7	0.3	0.8	1.3
Not specified .....	3,849	0.5	0.5	-	-	-	-	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	17.7	13.2	1.5	0.9	0.4	1.7	1.3
No .....	34,703	9.7	7.7	0.8	0.4	0.3	0.5	0.4
Don't know .....	1,447	19.8	15.3	1.5	0.6	0.1	2.3	2.1
Not specified .....	3,576	0.1	-	-	-	-	0.1	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 8C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON FINAL PRODUCT

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	12.4	-	2.9	4.3	4.7	0.5	4.3	6.3	66.0	11.0	0.4
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	9.6	-	2.4	3.4	3.2	0.6	4.1	6.6	68.0	11.7	0.7
35, Industrial Machinery and Equipment . . . . .	14,231	10.6	-	2.7	3.7	4.0	0.2	4.0	5.9	69.5	10.0	0.8
36, Electronic and Other Electric Equipment. . . . .	7,472	17.5	-	3.9	6.0	7.0	0.6	5.1	6.9	58.9	11.5	1.0
37, Transportation Equipment . . . . .	4,110	16.2	-	3.1	5.5	6.8	0.8	4.4	5.2	63.3	10.9	1.0
38, Instruments and Related Products. . . . .	3,988	14.7	-	3.6	4.5	5.8	0.8	4.4	7.1	62.9	10.9	1.0
Employment size:												
20 to 99. . . . .	30,502	8.0	-	2.2	2.8	2.6	0.4	3.8	5.8	70.5	11.9	0.5
100 to 499. . . . .	10,321	20.1	-	4.9	6.9	7.5	0.8	5.7	7.6	58.1	8.6	0.6
500 and over. . . . .	2,168	38.8	-	4.7	11.4	21.5	1.2	4.5	7.3	40.2	9.1	0.8
Age of plant (years):												
Less than 5 . . . . .	4,893	11.0	-	4.3	5.0	1.3	0.4	6.7	7.7	70.5	4.1	1.2
5 to 15. . . . .	13,722	13.3	-	2.8	4.5	5.6	0.4	4.6	7.2	71.2	3.7	0.8
16 to 30. . . . .	11,303	13.3	-	3.4	4.0	5.2	0.7	4.5	6.7	71.9	3.5	0.9
Over 30 . . . . .	9,310	15.7	-	3.0	5.7	6.4	0.6	3.7	6.4	71.1	3.2	0.8
Not specified . . . . .	3,763	0.2	-	0.1	-	0.1	-	1.0	-	10.8	88.1	0.1
Manufacturing process:												
Fabrication/machining. . . . .	6,795	13.1	-	4.6	4.5	3.7	0.3	5.2	6.7	71.3	3.6	1.3
Assembly. . . . .	6,388	15.7	-	3.8	5.7	5.8	0.4	4.3	6.6	70.5	2.8	1.0
Both. . . . .	23,393	13.4	-	2.8	4.5	5.5	0.6	4.9	7.5	70.9	3.3	0.6
Neither. . . . .	2,577	10.4	-	1.7	3.6	4.1	1.0	2.2	3.3	77.0	7.0	1.9
Not specified . . . . .	3,838	0.4	-	0.1	0.3	-	-	0.5	0.2	11.9	87.1	0.2
Market for most products:												
Consumer . . . . .	4,358	12.5	-	3.3	3.5	5.1	0.6	4.6	7.0	70.7	5.2	1.0
Commercial. . . . .	5,791	11.6	-	3.2	3.3	4.6	0.5	4.2	8.7	72.8	2.6	1.1
Industrial . . . . .	18,796	12.2	-	3.0	4.6	4.2	0.4	3.8	6.9	73.9	3.3	0.7
Transportation . . . . .	3,974	21.2	-	4.0	7.2	9.1	0.9	7.8	6.4	61.9	2.8	1.4
Government. . . . .	2,141	18.4	-	2.9	7.1	7.8	0.6	5.7	7.2	63.1	5.7	1.7
Other . . . . .	3,679	12.8	-	2.8	4.0	5.2	0.8	5.8	5.2	72.3	4.0	1.4
Not specified . . . . .	4,252	2.7	-	0.9	1.2	0.3	0.3	1.0	0.6	17.1	78.7	0.7
Market price for most products:												
Less than \$5 . . . . .	5,274	18.0	-	5.3	5.8	6.1	0.8	7.5	8.5	62.7	3.3	1.3
\$5 to \$100. . . . .	10,422	13.2	-	3.3	4.6	4.9	0.4	4.9	8.5	69.5	3.8	0.9
\$101 to \$1,000 . . . . .	8,846	13.8	-	2.4	4.7	6.3	0.4	4.7	6.5	71.9	2.9	1.1
\$1,001 to \$2,000 . . . . .	2,023	13.6	-	2.2	6.7	4.4	0.3	3.5	5.2	75.5	2.2	1.9
\$2,001 to \$10,000 . . . . .	4,265	9.7	-	2.7	3.2	3.5	0.3	4.3	7.0	75.7	3.2	1.1
Over \$10,000. . . . .	7,340	12.7	-	3.2	4.6	4.5	0.4	3.2	4.7	75.9	3.4	1.0
Not specified . . . . .	4,821	2.9	-	0.5	0.3	1.2	0.9	0.6	1.4	23.4	71.6	0.7
Products made to military specifications:												
Yes . . . . .	14,112	17.7	-	3.6	5.8	7.6	0.7	6.2	9.5	63.2	3.4	0.8
No . . . . .	22,214	11.4	-	2.8	4.2	3.9	0.5	4.2	5.4	75.4	3.7	0.6
Don't know . . . . .	2,939	11.1	-	4.3	3.1	3.0	0.7	1.0	5.9	78.6	3.4	1.6
Not specified . . . . .	3,726	0.2	-	0.1	-	0.1	-	0.1	0.2	10.5	88.9	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	19.3	-	3.9	6.6	8.1	0.7	6.9	9.1	62.2	2.5	1.1
26 to 75 percent . . . . .	2,499	16.6	-	3.1	7.4	5.7	0.4	6.3	9.0	64.6	3.4	1.8
Over 75 percent. . . . .	1,148	19.7	-	7.7	7.3	4.5	0.2	7.5	4.7	62.9	5.2	3.3
None . . . . .	11,808	9.3	-	2.6	3.3	3.0	0.4	3.7	4.3	79.1	3.6	0.6
Don't know . . . . .	13,573	12.2	-	2.8	3.9	4.9	0.6	3.4	7.4	73.2	3.8	0.7
Not specified . . . . .	4,029	0.8	-	0.4	0.1	0.2	0.1	0.4	0.5	14.5	83.8	0.2

See footnotes at the end of the table.



Table 8C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON FINAL PRODUCT—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	11.4	-	2.7	4.2	3.9	0.6	3.6	4.6	76.0	4.3	0.9
Less than 10 percent .....	15,360	13.6	-	3.3	4.3	5.6	0.4	5.5	8.7	69.1	3.1	0.7
10 to 19 percent .....	4,737	15.3	-	3.2	6.1	5.4	0.6	5.8	9.1	67.3	2.6	1.2
20 to 49 percent .....	3,912	17.5	-	4.3	5.9	6.4	0.9	4.3	6.2	69.0	3.0	1.2
50 percent or more .....	1,398	12.6	-	2.6	4.3	5.5	0.2	4.6	4.6	74.9	3.2	1.5
Not specified .....	3,897	1.6	-	0.5	0.2	0.9	-	0.3	0.5	11.0	86.5	0.6
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	12.7	-	2.3	5.4	4.9	0.1	2.7	5.8	74.7	4.1	2.3
In the plant .....	25,416	13.0	-	3.1	4.5	4.9	0.5	5.1	7.8	70.4	3.7	0.5
Elsewhere in the firm .....	4,969	23.0	-	5.3	7.3	9.0	1.4	6.1	7.1	60.9	2.9	1.3
No research and development done .....	7,046	8.9	-	2.4	3.2	3.2	0.1	2.8	4.1	81.2	3.0	1.2
Not specified .....	3,726	0.4	-	-	0.3	0.1	-	-	0.2	9.8	89.6	0.2
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	14.0	-	3.2	4.8	5.4	0.6	4.4	7.1	70.8	3.8	0.5
Elsewhere in the firm .....	1,099	22.9	-	5.0	7.8	9.3	0.8	7.1	7.7	59.8	2.5	2.8
Outside the firm .....	3,506	16.3	-	3.8	6.8	5.6	0.1	8.1	9.6	64.1	2.1	1.7
No formal training for staff .....	5,251	7.4	-	2.5	2.0	2.3	0.6	3.5	3.7	82.0	3.4	1.2
Not specified .....	3,686	0.5	-	0.1	-	0.3	0.1	0.2	0.5	8.4	90.4	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	13.4	-	3.0	4.4	5.5	0.5	3.9	7.0	71.8	3.9	0.6
Staff from outside the plant .....	1,637	22.5	-	5.6	8.4	7.5	1.0	9.3	8.5	58.0	1.7	2.1
Trainers from outside the firm .....	5,287	17.1	-	4.0	7.0	5.8	0.3	8.4	9.7	63.1	1.7	1.3
Not specified .....	9,115	4.7	-	1.6	1.4	1.3	0.4	2.2	2.1	51.9	39.1	0.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	9.4	-	2.4	3.3	3.3	0.4	3.5	5.8	77.7	3.6	0.6
Some problems .....	19,836	15.8	-	3.8	5.4	6.0	0.6	4.8	8.2	68.2	2.9	0.7
Very difficult .....	5,401	16.0	-	3.1	5.6	6.7	0.6	7.4	5.3	66.4	5.0	1.5
Not specified .....	3,849	0.4	-	0.2	0.2	-	-	0.3	0.4	11.6	87.3	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	24.0	-	6.2	8.2	8.6	1.0	5.8	8.3	59.0	2.8	1.7
No .....	34,703	12.1	-	2.9	4.2	4.6	0.4	4.5	6.7	72.8	3.7	0.5
Don't know .....	1,447	19.9	-	2.5	6.3	8.8	2.3	5.3	8.3	63.9	2.7	2.1
Not specified .....	3,576	0.2	-	0.1	-	0.1	-	-	-	6.9	92.9	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 8D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON FINAL PRODUCT**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	12.4	9.5	1.0	0.6	0.4	0.8	0.4
Major Group:								
34, Fabricated Metal Products.....	13,190	9.6	7.7	0.5	0.2	0.2	0.9	0.7
35, Industrial Machinery and Equipment.....	14,231	10.6	8.4	0.9	0.4	0.5	0.3	0.8
36, Electronic and Other Electric Equipment.....	7,472	17.6	12.4	1.9	1.5	0.5	1.3	1.0
37, Transportation Equipment.....	4,110	16.3	12.8	0.8	0.9	0.5	1.3	1.0
38, Instruments and Related Products.....	3,988	14.7	10.6	1.8	1.0	0.3	1.1	1.0
Employment size:								
20 to 99.....	30,502	7.9	6.3	0.5	0.2	0.3	0.6	0.5
100 to 499.....	10,321	19.9	14.8	2.0	1.3	0.7	1.2	0.6
500 and over.....	2,168	38.8	29.6	3.8	2.5	0.7	2.4	0.8
Age of plant (years):								
Less than 5.....	4,893	11.0	7.8	0.6	0.9	0.7	0.9	1.2
5 to 15.....	13,722	13.4	10.3	1.1	0.8	0.3	0.8	0.8
16 to 30.....	11,303	13.3	9.8	1.7	0.4	0.5	1.0	0.9
Over 30.....	9,310	15.6	12.7	0.8	0.7	0.3	1.0	0.8
Not specified.....	3,763	0.2	0.1	0.1	-	-	-	0.1
Manufacturing process:								
Fabrication/machining.....	6,795	13.1	10.5	1.1	0.3	0.2	0.9	1.3
Assembly.....	6,388	15.7	12.1	1.2	1.4	0.2	0.9	1.0
Both.....	23,393	13.5	10.3	1.2	0.6	0.6	0.9	0.6
Neither.....	2,577	10.6	7.6	0.9	0.1	0.3	1.6	1.9
Not specified.....	3,838	0.4	0.1	0.1	0.1	-	0.2	0.2
Market for most products:								
Consumer.....	4,358	12.6	9.7	0.8	0.8	0.1	1.1	1.0
Commercial.....	5,791	11.6	8.7	1.0	0.4	0.3	1.2	1.1
Industrial.....	18,796	12.2	9.5	1.0	0.6	0.5	0.5	0.7
Transportation.....	3,974	21.1	17.1	1.4	0.6	0.6	1.4	1.4
Government.....	2,141	18.4	12.4	1.9	2.8	0.6	0.7	1.7
Other.....	3,679	12.7	9.7	1.3	0.4	0.3	1.0	1.4
Not specified.....	4,252	2.7	1.7	0.2	-	-	0.8	0.7
Market price for most products:								
Less than \$5.....	5,274	18.1	13.8	1.6	0.7	0.4	1.6	1.3
\$5 to \$100.....	10,422	13.3	10.8	0.7	0.6	0.5	0.7	0.9
\$101 to \$1,000.....	8,846	13.9	10.5	1.3	0.7	0.4	1.0	1.1
\$1,001 to \$2,000.....	2,023	13.7	9.8	1.8	0.7	0.7	0.6	1.9
\$2,001 to \$10,000.....	4,265	9.7	7.4	1.0	0.6	0.2	0.4	1.1
Over \$10,000.....	7,340	12.8	9.7	1.2	0.9	0.4	0.5	1.0
Not specified.....	4,821	2.9	1.8	0.1	0.1	-	1.0	0.7
Products made to military specifications:								
Yes.....	14,112	17.6	13.3	1.6	1.1	0.5	1.1	0.8
No.....	22,214	11.3	8.9	0.9	0.5	0.3	0.8	0.6
Don't know.....	2,939	11.1	7.9	0.7	0.2	1.1	1.2	1.6
Not specified.....	3,726	0.2	0.1	0.1	-	-	-	0.1
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	19.2	15.3	1.7	0.7	0.3	1.3	1.1
26 to 75 percent.....	2,499	16.7	11.9	1.2	2.6	0.2	0.7	1.8
Over 75 percent.....	1,148	19.8	11.7	5.6	1.5	0.7	0.3	3.3
None.....	11,808	9.3	7.1	0.7	0.3	0.5	0.6	0.6
Don't know.....	13,573	12.2	9.5	0.7	0.6	0.4	1.0	0.7
Not specified.....	4,029	0.8	0.3	0.2	-	-	0.3	0.2

See footnotes at the end of the table.

Table 8D. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: AUTOMATED SENSOR-BASED INSPECTION OR TESTING PERFORMED ON FINAL PRODUCT**—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	11.5	9.3	1.0	0.3	0.2	0.8	0.9
Less than 10 percent .....	15,360	13.7	11.0	1.0	0.8	0.3	0.8	0.7
10 to 19 percent .....	4,737	15.3	11.0	1.2	0.7	0.9	1.5	1.2
20 to 49 percent .....	3,912	17.5	11.9	1.9	1.4	0.9	1.3	1.2
50 percent or more .....	1,398	12.5	7.0	2.1	1.4	1.0	1.0	1.5
Not specified .....	3,897	1.6	1.3	-	-	0.2	0.1	0.6
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	12.7	10.1	0.3	0.8	-	1.4	2.3
In this plant .....	25,416	13.0	9.7	1.2	0.7	0.5	0.9	0.5
Elsewhere in the firm .....	4,969	23.0	17.7	1.5	1.1	0.8	1.8	1.3
No research and development done ..	7,046	9.0	7.7	0.8	0.2	-	0.2	1.2
Not specified .....	3,726	0.4	0.2	-	-	-	0.2	0.2
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	14.0	10.8	1.2	0.6	0.5	0.9	0.5
Elsewhere in the firm .....	1,099	22.8	18.6	1.2	0.7	0.2	2.2	2.8
Outside the firm .....	3,506	16.2	12.8	1.7	1.0	-	0.6	1.7
No formal training for staff conducted ..	5,251	7.4	4.9	0.6	0.6	0.5	0.7	1.2
Not specified .....	3,686	0.4	0.3	-	-	-	0.1	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	13.4	10.5	1.2	0.6	0.5	0.8	0.6
Staff from outside the plant .....	1,637	22.4	18.3	0.9	1.5	0.4	1.3	2.1
Trainers from outside the firm .....	5,287	17.2	13.2	1.7	1.1	0.1	1.2	1.3
Not specified .....	9,115	4.7	3.0	0.4	0.3	0.3	0.7	0.6
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	9.4	7.3	0.6	0.4	0.2	0.8	0.6
Some problems .....	19,836	15.9	12.0	1.4	0.9	0.6	1.0	0.7
Very difficult .....	5,401	15.9	12.7	1.4	0.7	0.3	0.8	1.5
Not specified .....	3,849	0.4	0.4	-	-	-	-	0.3
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	24.1	17.4	1.6	1.4	1.5	2.1	1.7
No .....	34,703	12.2	9.5	1.1	0.6	0.3	0.7	0.5
Don't know .....	1,447	19.8	14.2	1.3	0.9	1.0	2.5	2.1
Not specified .....	3,576	0.2	0.1	-	-	-	0.1	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 9A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: LOCAL AREA NETWORKS FOR TECHNICAL DATA

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2-5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2-5 years	No plans to use	Not specified	
All establishments. . . . .	42,991	28.8	-	9.9	11.7	6.0	1.2	8.4	6.5	45.8	10.5	0.6
Major Group:												
34, Fabricated Metal Products.	13,190	20.1	-	7.4	7.7	4.0	1.0	8.0	5.5	55.4	11.0	1.2
35, Industrial Machinery and Equipment . . . . .	14,231	29.3	-	9.7	12.4	6.2	1.0	7.7	6.9	46.2	9.8	1.2
36, Electronic and Other Electric Equipment. . . . .	7,472	37.1	-	13.0	15.2	7.4	1.5	9.9	8.0	33.8	11.1	1.2
37, Transportation Equipment .	4,110	28.0	-	9.4	10.7	6.8	1.1	7.8	5.9	47.4	10.9	1.3
38, Instruments and Related Products. . . . .	3,988	40.7	-	13.7	16.6	8.4	2.0	9.6	6.3	33.3	10.2	1.5
Employment size:												
20 to 99. . . . .	30,502	20.5	-	7.5	8.6	3.5	0.9	7.5	6.9	53.6	11.5	0.8
100 to 499. . . . .	10,321	44.1	-	15.6	17.5	9.4	1.6	11.5	6.3	29.9	8.2	0.8
500 and over. . . . .	2,168	72.4	-	17.2	27.3	25.2	2.7	6.0	2.3	11.3	8.0	0.7
Age of plant (years):												
Less than 5 . . . . .	4,893	32.9	-	14.0	13.3	3.7	1.9	11.6	6.6	45.4	3.5	1.9
5 to 15. . . . .	13,722	32.8	-	11.5	13.9	6.0	1.4	8.9	7.6	47.5	3.2	1.2
16 to 30. . . . .	11,303	30.0	-	9.7	11.5	7.5	1.3	8.6	7.0	51.3	3.1	1.2
Over 30 . . . . .	9,310	30.3	-	9.5	12.5	7.6	0.7	8.9	7.0	51.1	2.8	1.3
Not specified . . . . .	3,763	1.5	-	0.7	0.1	0.5	0.2	0.3	0.1	10.5	87.8	0.4
Manufacturing process:												
Fabrication/machining. . . . .	6,795	21.6	-	7.9	8.2	3.7	1.8	8.2	7.8	59.7	2.7	1.7
Assembly. . . . .	6,388	40.2	-	13.9	16.7	8.2	1.4	9.6	7.2	39.5	3.4	1.4
Both. . . . .	23,393	33.3	-	11.4	13.7	7.1	1.1	9.8	7.3	47.0	2.7	0.9
Neither. . . . .	2,577	19.4	-	5.8	7.0	5.3	1.3	4.7	3.5	65.3	7.1	2.3
Not specified . . . . .	3,838	1.5	-	0.7	0.4	0.1	0.3	0.5	0.5	10.9	86.7	0.4
Market for most products:												
Consumer . . . . .	4,358	20.6	-	7.9	7.7	4.1	0.9	11.1	7.8	55.1	5.3	1.4
Commercial . . . . .	5,791	38.6	-	15.1	15.5	6.7	1.3	9.0	7.6	42.5	2.2	1.8
Industrial . . . . .	18,796	30.3	-	9.9	12.4	6.7	1.3	8.9	6.7	51.1	3.0	1.0
Transportation . . . . .	3,974	33.9	-	11.3	13.1	8.3	1.2	9.4	8.5	45.2	2.9	1.9
Government. . . . .	2,141	45.3	-	13.0	18.7	11.9	1.7	7.9	5.7	39.7	1.4	3.0
Other . . . . .	3,679	27.8	-	9.2	13.4	4.1	1.1	8.6	7.3	52.2	4.1	1.9
Not specified . . . . .	4,252	4.7	-	2.4	1.0	0.7	0.6	1.5	0.7	15.2	77.9	0.7
Market price for most products:												
Less than \$5 . . . . .	5,274	25.3	-	8.4	11.5	4.5	0.9	10.2	7.3	53.4	3.7	1.8
\$5 to \$100 . . . . .	10,422	24.2	-	10.1	9.1	4.3	0.7	10.0	8.0	54.3	3.5	1.1
\$101 to \$1,000 . . . . .	8,846	29.6	-	10.3	11.5	6.3	1.5	9.4	7.3	51.0	2.7	1.5
\$1,001 to \$2,000 . . . . .	2,023	30.7	-	10.2	14.0	4.1	2.4	9.8	4.7	52.9	1.8	2.8
\$2,001 to \$10,000 . . . . .	4,265	34.7	-	12.0	15.2	6.7	0.8	8.6	7.5	46.4	2.8	2.0
Over \$10,000. . . . .	7,340	48.2	-	14.6	18.9	12.6	2.1	7.8	6.4	35.8	1.8	1.6
Not specified . . . . .	4,821	5.4	-	1.3	2.5	1.1	0.5	0.9	1.3	21.2	71.2	1.0
Products made to military specifications:												
Yes . . . . .	14,112	35.0	-	11.5	14.2	7.7	1.6	10.6	8.5	43.5	2.4	1.2
No . . . . .	22,214	29.8	-	10.7	12.0	6.1	1.0	8.3	6.6	51.7	3.5	0.9
Don't know . . . . .	2,939	25.6	-	7.8	10.9	5.2	1.7	8.5	4.3	57.4	4.2	2.4
Not specified . . . . .	3,726	1.2	-	0.6	0.3	-	0.3	0.2	0.2	9.8	88.5	0.4
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	38.9	-	12.9	16.2	8.0	1.8	10.4	9.2	39.5	2.1	1.5
26 to 75 percent . . . . .	2,499	35.7	-	12.1	15.0	7.6	1.0	10.4	10.6	41.4	1.8	3.0
Over 75 percent. . . . .	1,148	31.5	-	13.8	8.6	8.6	0.5	13.0	5.2	46.1	4.2	4.1
None . . . . .	11,808	23.9	-	8.4	9.5	5.2	0.8	7.6	5.7	59.6	3.2	1.1
Don't know . . . . .	13,573	31.6	-	10.9	12.9	6.4	1.4	9.3	6.5	49.0	3.6	1.1
Not specified . . . . .	4,029	3.3	-	1.0	1.6	0.4	0.3	0.1	0.4	12.7	83.5	0.7

See footnotes at the end of the table.

Table 9A. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: LOCAL AREA NETWORKS FOR TECHNICAL DATA—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2-5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2-5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	18.2	-	6.7	7.2	3.2	1.1	7.8	6.8	63.3	4.1	1.1
Less than 10 percent. ....	15,360	31.6	-	10.2	13.4	7.1	0.9	9.8	7.8	48.0	2.7	1.1
10 to 19 percent .....	4,737	44.4	-	17.1	18.0	7.9	1.4	10.9	6.2	36.7	1.8	1.9
20 to 49 percent .....	3,912	55.0	-	18.2	20.9	13.5	2.4	8.8	7.8	26.2	2.1	2.0
50 percent or more .....	1,398	47.3	-	15.2	19.4	10.0	2.7	9.6	6.2	34.8	2.1	3.2
Not specified .....	3,897	2.6	-	0.9	0.8	0.4	0.5	0.5	0.6	10.3	86.0	0.5
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	21.2	-	7.8	8.6	4.5	0.3	7.3	5.1	65.2	1.2	3.1
In the plant .....	25,416	35.0	-	12.1	14.3	7.2	1.4	9.7	7.8	44.5	3.1	0.8
Elsewhere in the firm. ....	4,969	40.4	-	14.2	15.1	9.9	1.2	11.3	6.7	38.4	3.2	1.8
No research and development done. ....	7,046	14.9	-	4.5	6.5	2.6	1.3	6.0	5.6	70.2	3.3	1.6
Not specified .....	3,726	1.3	-	0.7	0.4	0.1	0.1	0.2	0.2	8.8	89.5	0.4
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	32.2	-	10.8	13.0	7.1	1.3	8.9	7.0	48.7	3.2	0.8
Elsewhere in the firm. ....	1,099	41.0	-	13.5	15.2	11.5	0.8	14.2	7.3	33.5	4.1	3.9
Outside the firm .....	3,506	38.7	-	15.8	15.0	6.6	1.3	10.7	10.2	38.2	2.2	2.4
No formal training for staff. . . .	5,251	19.8	-	6.4	9.4	2.6	1.4	8.2	5.4	64.1	2.5	1.7
Not specified .....	3,686	1.6	-	0.9	0.3	0.3	0.1	0.5	0.6	7.1	90.2	0.4
Who conducts most of the formal training for the staff:												
Staff from inside the plant. . . .	26,952	30.6	-	10.1	12.6	6.8	1.1	8.6	6.9	50.6	3.3	0.8
Staff from outside the plant. . . .	1,637	40.8	-	14.5	13.4	11.1	1.8	13.5	10.2	33.3	2.1	3.1
Trainers from outside the firm. .	5,287	44.4	-	17.7	17.3	7.8	1.6	10.9	8.9	34.0	1.8	1.9
Not specified .....	9,115	12.3	-	4.0	5.4	1.8	1.1	5.3	3.3	40.5	38.5	1.0
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	27.0	-	9.4	10.9	5.9	0.8	6.9	5.1	57.5	3.4	1.1
Some problems .....	19,836	35.1	-	11.7	14.8	7.0	1.6	10.9	7.9	43.7	2.4	1.0
Very difficult .....	5,401	29.3	-	11.3	10.0	6.7	1.3	8.6	9.4	48.4	4.3	1.9
Not specified .....	3,849	1.9	-	0.6	0.9	0.1	0.3	0.2	0.5	10.5	87.0	0.5
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	48.2	-	16.9	19.4	10.4	1.5	10.2	5.2	33.7	2.6	2.0
No .....	34,703	29.2	-	9.9	12.0	6.0	1.3	9.0	7.3	51.4	3.1	0.7
Don't know .....	1,447	44.6	-	17.8	14.0	11.1	1.7	10.2	5.9	36.4	3.0	3.1
Not specified .....	3,576	0.9	-	0.6	0.2	0.1	-	-	0.2	6.1	92.8	0.3

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 9B. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: LOCAL AREA NETWORKS FOR TECHNICAL DATA

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	28.8	8.3	12.2	2.0	4.1	2.3	0.6
Major Group:								
34, Fabricated Metal Products.....	13,190	20.1	6.2	7.7	1.5	2.7	1.9	1.2
35, Industrial Machinery and Equipment.....	14,231	29.4	8.1	13.2	1.9	4.6	1.6	1.2
36, Electronic and Other Electric Equipment.....	7,472	37.1	10.5	16.6	2.3	4.8	2.9	1.2
37, Transportation Equipment.....	4,110	28.0	7.9	11.3	2.0	4.2	2.6	1.3
38, Instruments and Related Products.....	3,988	40.7	12.2	15.3	2.7	5.6	4.9	1.5
Employment size:								
20 to 99.....	30,502	20.5	5.8	8.8	1.4	2.7	1.8	0.8
100 to 499.....	10,321	43.9	12.8	18.7	2.4	6.8	3.2	0.8
500 and over.....	2,168	72.5	21.3	28.4	7.5	10.5	5.0	0.7
Age of plant (years):								
Less than 5.....	4,893	32.9	8.8	13.9	1.9	4.3	3.9	1.9
5 to 15.....	13,722	32.8	9.5	14.0	2.1	4.6	2.6	1.2
16 to 30.....	11,303	30.0	9.2	13.1	1.8	3.8	2.2	1.2
Over 30.....	9,310	30.3	8.4	12.1	2.7	5.1	1.9	1.3
Not specified.....	3,763	1.4	-	0.4	-	0.4	0.5	0.4
Manufacturing process:								
Fabrication/machining.....	6,795	21.6	6.8	7.9	1.3	2.7	2.9	1.7
Assembly.....	6,388	40.3	12.0	17.4	2.6	4.9	3.4	1.4
Both.....	23,393	33.3	9.2	14.5	2.4	5.1	2.1	0.9
Neither.....	2,577	19.4	6.6	6.6	1.3	2.7	2.3	2.3
Not specified.....	3,838	1.4	0.1	0.4	-	0.1	0.8	0.4
Market for most products:								
Consumer.....	4,358	20.7	6.6	8.1	0.9	3.2	1.8	1.4
Commercial.....	5,791	38.7	12.1	15.0	2.8	6.0	2.8	1.8
Industrial.....	18,796	30.3	8.4	13.8	1.7	4.0	2.4	1.0
Transportation.....	3,974	33.9	8.1	13.6	3.0	6.6	2.6	1.9
Government.....	2,141	45.4	13.5	19.2	5.4	4.8	2.6	3.0
Other.....	3,679	27.8	9.0	10.8	2.0	4.1	2.0	1.9
Not specified.....	4,252	4.8	1.1	1.5	0.4	0.1	1.7	0.7
Market price for most products:								
Less than \$5.....	5,274	25.4	8.3	8.9	2.0	4.1	2.1	1.8
\$5 to \$100.....	10,422	24.2	8.1	9.0	1.7	3.8	1.7	1.1
\$101 to \$1,000.....	8,846	29.6	8.5	12.5	1.6	4.5	2.5	1.5
\$1,001 to \$2,000.....	2,023	30.7	7.6	13.5	3.0	3.8	2.8	2.8
\$2,001 to \$10,000.....	4,265	34.7	8.8	17.9	2.0	3.9	2.1	2.0
Over \$10,000.....	7,340	48.1	12.7	21.3	3.4	6.6	4.1	1.6
Not specified.....	4,821	5.3	1.6	2.3	0.2	0.5	0.8	1.0
Products made to military specifications:								
Yes.....	14,112	35.0	9.9	15.0	2.5	4.7	2.8	1.2
No.....	22,214	29.9	8.8	12.7	2.0	4.1	2.3	0.9
Don't know.....	2,939	25.5	6.8	9.1	1.7	6.0	2.0	2.4
Not specified.....	3,726	1.3	0.1	0.3	-	0.1	0.8	0.4
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies who are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	38.8	11.3	16.5	3.2	4.8	3.1	1.5
26 to 75 percent.....	2,499	35.8	10.0	15.6	3.7	4.8	1.7	3.0
Over 75 percent.....	1,148	31.6	14.7	12.0	1.2	2.1	1.6	4.1
None.....	11,808	23.9	6.3	10.9	1.6	3.1	2.0	1.1
Don't know.....	13,573	31.7	9.3	12.5	1.6	5.6	2.6	1.1
Not specified.....	4,029	3.3	0.4	1.8	-	0.2	0.8	0.7

See footnotes at the end of the table.



Table 9B. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: LOCAL AREA NETWORKS FOR TECHNICAL DATA—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	18.2	4.9	7.4	1.2	2.8	1.9	1.1
Less than 10 percent .....	15,360	31.6	9.0	14.0	2.5	4.3	1.8	1.1
10 to 19 percent .....	4,737	44.5	15.2	17.9	2.3	5.6	3.5	1.9
20 to 49 percent .....	3,912	55.0	15.0	23.2	3.3	8.7	4.8	2.0
50 percent or more .....	1,398	47.3	13.4	18.8	3.1	6.7	5.3	3.2
Not specified .....	3,897	2.6	0.2	1.1	0.2	0.2	0.8	0.5
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	21.2	8.5	6.4	0.7	2.0	3.7	3.1
In this plant .....	25,416	34.9	9.8	15.6	2.3	4.7	2.6	0.8
Elsewhere in the firm .....	4,969	40.3	13.5	15.2	2.6	6.3	2.7	1.8
No research and development done ..	7,046	14.9	3.3	5.3	1.7	3.0	1.6	1.6
Not specified .....	3,726	1.3	0.1	0.4	0.1	0.1	0.6	0.4
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	32.2	9.7	13.3	2.1	4.4	2.6	0.8
Elsewhere in the firm .....	1,099	40.9	12.3	12.6	5.5	7.2	3.3	3.9
Outside the firm .....	3,506	38.6	11.1	17.0	3.3	5.2	2.1	2.4
No formal training for staff conducted .....	5,251	19.8	3.3	10.6	0.9	3.3	1.6	1.7
Not specified .....	3,686	1.7	0.1	0.7	-	0.3	0.5	0.4
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	30.5	8.9	13.0	1.9	4.4	2.4	0.8
Staff from outside the plant .....	1,637	40.8	13.1	14.3	5.0	5.8	2.6	3.1
Trainers from outside the firm .....	5,287	44.4	14.5	17.5	3.7	5.6	3.1	1.9
Not specified .....	9,115	12.3	2.0	6.2	0.6	2.1	1.4	1.0
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	27.1	8.6	11.2	1.6	3.9	1.8	1.1
Some problems .....	19,836	35.0	9.7	15.0	2.4	4.9	3.1	1.0
Very difficult .....	5,401	29.4	8.1	12.1	2.8	4.2	2.1	1.9
Not specified .....	3,849	1.9	0.3	0.9	-	0.2	0.5	0.5
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	48.3	14.0	21.4	2.0	7.5	3.4	2.0
No .....	34,703	29.2	8.5	12.2	2.1	4.0	2.4	0.7
Don't know .....	1,447	44.5	10.6	20.1	3.3	7.4	3.1	3.1
Not specified .....	3,576	0.9	-	0.5	-	-	0.4	0.3

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 9C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: LOCAL AREA NETWORKS FOR FACTORY USE

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" <sup>3</sup> (percent)
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments . . . . .	42,991	21.8	-	7.6	8.0	5.3	0.9	9.7	8.7	49.1	10.8	0.5
Major Group:												
34, Fabricated Metal Products .	13,190	14.5	-	5.4	4.9	3.8	0.4	8.9	8.6	56.6	11.3	1.0
35, Industrial Machinery and Equipment . . . . .	14,231	21.1	-	7.0	8.5	4.9	0.7	9.1	9.4	50.5	10.0	1.1
36, Electronic and Other Electric Equipment . . . . .	7,472	30.5	-	11.3	10.3	7.3	1.6	11.2	8.6	38.2	11.4	1.2
37, Transportation Equipment .	4,110	23.8	-	8.2	8.7	6.2	0.7	9.6	6.8	48.8	10.9	1.2
38, Instruments and Related Products . . . . .	3,988	30.1	-	9.5	11.8	6.9	1.9	11.8	8.1	39.6	10.4	1.4
Employment size:												
20 to 99 . . . . .	30,502	14.7	-	5.6	5.3	3.1	0.7	8.2	8.7	56.6	11.8	0.7
100 to 499 . . . . .	10,321	34.3	-	12.4	12.6	8.1	1.2	13.9	9.3	34.4	8.1	0.8
500 and over . . . . .	2,168	63.4	-	13.6	25.3	22.5	2.0	10.5	4.5	13.3	8.3	0.8
Age of plant (years):												
Less than 5 . . . . .	4,893	22.7	-	9.9	8.9	2.7	1.2	13.7	9.8	50.2	3.5	1.6
5 to 15 . . . . .	13,722	24.9	-	9.4	8.5	5.6	1.4	10.5	10.0	51.2	3.3	1.1
16 to 30 . . . . .	11,303	22.7	-	7.6	8.4	6.2	0.5	10.4	8.6	54.7	3.7	1.1
Over 30 . . . . .	9,310	24.0	-	6.8	9.5	7.0	0.7	9.3	9.5	54.2	2.9	1.1
Not specified . . . . .	3,763	0.9	-	0.1	0.4	0.2	0.2	0.3	0.3	10.6	87.9	0.3
Manufacturing process:												
Fabrication/machining . . . . .	6,795	18.3	-	6.6	6.7	3.8	1.2	9.1	10.0	59.9	2.7	1.5
Assembly . . . . .	6,388	31.8	-	10.9	11.5	7.9	1.5	10.3	8.3	46.6	3.0	1.3
Both . . . . .	23,393	24.4	-	8.4	9.3	5.9	0.8	11.3	10.2	51.1	3.0	0.8
Neither . . . . .	2,577	14.2	-	5.9	2.7	4.9	0.7	8.5	4.7	64.7	7.9	2.0
Not specified . . . . .	3,838	0.8	-	-	0.6	0.1	0.1	1.0	0.2	11.3	86.7	0.3
Market for most products:												
Consumer . . . . .	4,358	20.9	-	8.3	6.8	4.4	1.4	11.2	8.8	54.1	5.0	1.5
Commercial . . . . .	5,791	27.5	-	11.2	9.5	5.6	1.2	12.9	9.7	47.8	2.2	1.6
Industrial . . . . .	18,796	21.7	-	7.0	8.3	5.6	0.8	10.1	9.2	55.8	3.2	0.9
Transportation . . . . .	3,974	29.2	-	9.3	11.0	8.3	0.6	12.3	9.7	46.1	2.6	1.8
Government . . . . .	2,141	30.8	-	8.5	13.3	8.0	1.0	7.2	10.4	48.5	3.1	2.5
Other . . . . .	3,679	22.3	-	8.6	7.7	5.1	0.9	9.0	10.3	54.1	4.2	1.7
Not specified . . . . .	4,252	3.5	-	1.8	1.0	0.3	0.4	1.2	1.4	14.9	78.9	0.7
Market price for most products:												
Less than \$5 . . . . .	5,274	24.6	-	9.9	7.8	5.8	1.1	11.3	8.6	52.1	3.6	1.7
\$5 to \$100 . . . . .	10,422	20.7	-	7.5	8.0	4.4	0.8	12.4	9.7	53.9	3.3	1.1
\$101 to \$1,000 . . . . .	8,846	25.4	-	9.8	8.8	5.7	1.1	10.8	9.6	51.1	3.2	1.4
\$1,001 to \$2,000 . . . . .	2,023	22.3	-	7.3	10.7	3.3	1.0	8.8	8.2	58.5	2.2	2.3
\$2,001 to \$10,000 . . . . .	4,265	23.2	-	8.3	8.3	5.8	0.8	8.3	10.7	54.5	3.3	1.6
Over \$10,000 . . . . .	7,340	27.9	-	7.6	10.5	8.7	1.1	10.5	9.7	49.4	2.5	1.3
Not specified . . . . .	4,821	3.9	-	1.1	1.8	0.9	0.1	0.5	1.7	22.6	71.4	0.9
Products made to military specifications:												
Yes . . . . .	14,112	28.6	-	9.7	10.6	7.1	1.2	11.8	9.8	47.0	2.7	1.1
No . . . . .	22,214	21.1	-	7.4	7.9	5.1	0.7	9.7	9.4	56.1	3.7	0.7
Don't know . . . . .	2,939	21.1	-	8.7	6.8	4.3	1.3	11.5	7.7	55.8	3.9	2.1
Not specified . . . . .	3,726	0.6	-	0.2	0.3	-	0.1	0.1	0.3	10.2	88.7	0.3
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	31.1	-	10.6	11.3	8.0	1.2	12.3	9.9	44.4	2.3	1.4
26 to 75 percent . . . . .	2,499	28.3	-	11.0	9.9	6.8	0.6	9.7	15.1	44.9	2.1	2.7
Over 75 percent . . . . .	1,148	24.2	-	10.6	6.5	6.1	1.0	9.3	7.3	53.9	5.3	3.5
None . . . . .	11,808	17.5	-	7.0	6.0	3.6	0.9	8.2	8.0	62.5	3.7	0.9
Don't know . . . . .	13,573	23.2	-	7.1	9.3	5.9	0.9	11.8	9.7	51.8	3.5	1.0
Not specified . . . . .	4,029	1.7	-	0.4	0.9	0.3	0.1	0.5	0.4	13.6	83.7	0.5

See footnotes at the end of the table.

Table 9C. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: LOCAL AREA NETWORKS FOR FACTORY USE—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None . . . . .	13,687	13.8	-	5.2	4.8	3.0	0.8	8.5	8.7	64.8	4.2	1.0
Less than 10 percent . . . . .	15,360	25.2	-	8.3	9.6	6.5	0.8	11.1	10.0	50.3	3.3	1.0
10 to 19 percent . . . . .	4,737	33.8	-	13.7	12.6	6.4	1.1	13.3	9.2	42.2	1.5	1.7
20 to 49 percent . . . . .	3,912	37.4	-	12.2	13.2	10.6	1.4	11.9	10.6	37.6	2.5	1.9
50 percent or more . . . . .	1,398	32.9	-	10.2	12.8	8.4	1.5	11.2	8.1	45.0	2.7	2.7
Not specified . . . . .	3,897	1.4	-	0.3	0.5	0.3	0.3	1.1	0.8	10.7	85.9	0.3
Where is most of the research and development work for the plant done:												
Outside the firm . . . . .	1,834	15.5	-	7.3	5.1	3.0	0.1	9.0	10.2	64.1	1.2	2.5
In the plant. . . . .	25,416	26.2	-	9.3	9.8	6.0	1.1	11.4	9.9	49.1	3.5	0.8
Elsewhere in the firm . . . . .	4,969	35.2	-	10.5	13.3	10.2	1.2	13.0	9.3	39.6	2.8	1.6
No research and development done . . . . .	7,046	9.4	-	3.7	2.7	2.5	0.5	6.5	7.7	73.1	3.3	1.3
Not specified . . . . .	3,726	0.5	-	-	0.4	0.1	-	0.3	0.3	9.1	89.6	0.2
Where is most of the formal training for the plant conducted:												
In the plant. . . . .	29,449	25.1	-	8.7	9.4	6.1	0.9	10.3	9.5	51.4	3.6	0.7
Elsewhere in the firm . . . . .	1,099	35.0	-	8.8	13.0	12.0	1.2	19.0	8.0	36.6	1.4	3.4
Outside the firm . . . . .	3,506	27.4	-	11.7	8.4	5.8	1.5	15.1	13.2	41.4	3.0	2.0
No formal training for staff. . . . .	5,251	11.0	-	3.6	4.3	2.4	0.7	7.1	6.5	73.0	2.3	1.2
Not specified . . . . .	3,686	1.2	-	0.3	0.5	0.4	-	0.4	0.7	7.4	90.3	0.3
Who conducts most of the formal training for the staff:												
Staff from inside the plant . . . . .	26,952	23.7	-	8.1	8.7	6.0	0.9	9.8	9.2	53.6	3.7	0.7
Staff from outside the plant . . . . .	1,637	37.7	-	10.9	12.8	11.6	2.4	16.5	11.2	33.9	0.7	2.9
Trainers from outside the firm . . . . .	5,287	32.4	-	13.2	12.4	6.0	0.8	16.0	12.6	36.6	2.4	1.7
Not specified . . . . .	9,115	7.2	-	2.3	2.8	1.4	0.7	4.5	4.2	45.7	38.4	0.7
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult. . . . .	13,905	19.8	-	6.3	7.5	5.3	0.7	8.3	7.4	61.1	3.3	0.9
Some problems . . . . .	19,836	26.4	-	9.6	9.6	5.9	1.3	12.3	10.1	48.4	2.8	0.9
Very difficult. . . . .	5,401	24.1	-	8.8	8.9	6.1	0.3	10.8	12.3	48.2	4.6	1.8
Not specified . . . . .	3,849	1.3	-	0.3	0.3	0.4	0.3	-	0.8	10.8	87.1	0.4
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes. . . . .	3,265	36.8	-	12.0	14.6	9.2	1.0	13.2	8.9	38.5	2.6	1.8
No . . . . .	34,703	22.1	-	7.8	8.1	5.3	0.9	10.1	9.5	54.7	3.4	0.6
Don't know. . . . .	1,447	29.8	-	11.5	9.3	8.0	1.0	15.0	8.6	44.0	2.6	2.3
Not specified . . . . .	3,576	0.6	-	0.1	0.4	-	0.1	0.1	0.2	6.3	92.9	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 9D. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: LOCAL AREA NETWORKS FOR FACTORY USE

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	21.8	6.4	8.6	1.7	3.4	1.7	0.5
Major Group:								
34, Fabricated Metal Products.....	13,190	14.5	4.8	5.3	0.8	2.4	1.2	1.0
35, Industrial Machinery and Equipment.....	14,231	21.0	4.9	9.7	1.5	3.7	1.2	1.1
36, Electronic and Other Electric Equipment.....	7,472	30.5	9.5	11.4	2.5	4.3	2.7	1.2
37, Transportation Equipment.....	4,110	23.9	7.6	8.2	2.5	3.3	2.2	1.2
38, Instruments and Related Products.....	3,988	30.0	9.9	10.5	2.9	3.8	2.9	1.4
Employment size:								
20 to 99.....	30,502	14.6	4.1	6.1	0.9	2.4	1.2	0.7
100 to 499.....	10,321	34.1	10.3	12.9	2.9	5.3	2.8	0.8
500 and over.....	2,168	63.4	19.7	23.5	7.4	8.8	4.2	0.8
Age of plant (years):								
Less than 5.....	4,893	22.7	8.4	7.8	1.4	3.1	2.0	1.6
5 to 15.....	13,722	25.0	6.8	10.2	1.6	4.0	2.3	1.1
16 to 30.....	11,303	22.6	6.7	9.1	2.2	3.4	1.3	1.1
Over 30.....	9,310	24.0	6.9	9.5	2.0	3.9	1.7	1.1
Not specified.....	3,763	1.0	-	0.3	0.1	0.3	0.3	0.3
Manufacturing process:								
Fabrication/machining.....	6,795	18.2	6.3	6.4	0.9	2.6	2.0	1.5
Assembly.....	6,388	31.8	11.3	11.5	2.5	3.6	2.9	1.3
Both.....	23,393	24.4	6.1	10.3	2.2	4.2	1.6	0.8
Neither.....	2,577	14.3	6.5	4.2	0.3	2.3	0.9	2.0
Not specified.....	3,838	0.8	0.1	0.4	-	0.1	0.2	0.3
Market for most products:								
Consumer.....	4,358	20.9	5.8	7.0	1.1	4.2	2.8	1.5
Commercial.....	5,791	27.4	8.9	10.7	2.4	3.8	1.7	1.6
Industrial.....	18,796	21.7	6.1	9.2	1.5	3.6	1.3	0.9
Transportation.....	3,974	29.2	7.9	11.4	2.8	4.9	2.3	1.8
Government.....	2,141	30.7	10.1	11.9	3.6	2.8	2.3	2.5
Other.....	3,679	22.3	6.7	8.3	2.1	3.3	1.8	1.7
Not specified.....	4,252	3.5	1.0	1.0	0.1	0.1	1.3	0.7
Market price for most products:								
Less than \$5.....	5,274	24.5	8.0	8.8	2.0	3.9	1.8	1.7
\$5 to \$100.....	10,422	20.7	7.0	7.2	1.5	3.8	1.3	1.1
\$101 to \$1,000.....	8,846	25.3	7.4	9.6	1.4	4.1	2.8	1.4
\$1,001 to \$2,000.....	2,023	22.2	5.8	9.5	2.3	2.6	2.1	2.3
\$2,001 to \$10,000.....	4,265	23.2	5.8	11.3	2.1	2.8	1.2	1.6
Over \$10,000.....	7,340	28.0	6.9	12.1	2.8	4.1	2.1	1.3
Not specified.....	4,821	3.8	1.2	1.8	0.2	0.5	0.2	0.9
Products made to military specifications:								
Yes.....	14,112	28.6	8.3	11.7	2.7	3.9	1.9	1.1
No.....	22,214	21.1	6.3	8.2	1.4	3.4	1.8	0.7
Don't know.....	2,939	21.1	5.5	7.3	1.2	5.3	1.8	2.1
Not specified.....	3,726	0.7	0.1	0.3	-	-	0.2	0.3
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies that are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	31.1	8.9	13.4	2.3	4.3	2.2	1.4
26 to 75 percent.....	2,499	28.3	8.9	11.7	3.0	3.8	0.9	2.7
Over 75 percent.....	1,148	24.2	7.9	9.7	3.9	1.4	1.3	3.5
None.....	11,808	17.5	4.2	6.8	1.7	3.1	1.7	0.9
Don't know.....	13,573	23.2	7.6	8.3	1.4	4.1	1.9	1.0
Not specified.....	4,029	1.8	0.3	1.0	-	0.1	0.3	0.5

See footnotes at the end of the table.

Table 9D. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: LOCAL AREA NETWORKS FOR FACTORY USE—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments which are exported for direct sale:								
None .....	13,687	13.9	3.4	5.5	1.1	2.3	1.6	1.0
Less than 10 percent .....	15,360	25.3	7.5	10.2	2.1	4.2	1.3	1.0
10 to 19 percent .....	4,737	33.8	11.1	13.3	2.8	3.9	2.7	1.7
20 to 49 percent .....	3,912	37.4	11.2	14.3	2.5	6.0	3.3	1.9
50 percent or more .....	1,398	32.8	10.5	11.8	2.6	5.1	2.8	2.7
Not specified .....	3,897	1.4	0.2	0.8	0.2	0.1	0.3	0.3
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	15.6	5.4	4.2	0.8	3.0	2.3	2.5
In this plant .....	25,416	26.1	7.6	10.9	1.9	3.7	2.0	0.8
Elsewhere in the firm .....	4,969	35.2	10.4	12.2	3.6	6.6	2.4	1.6
No research and development done ..	7,046	9.5	2.7	3.2	0.8	2.0	0.8	1.3
Not specified .....	3,726	0.5	0.1	0.4	-	-	0.1	0.2
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	25.1	7.6	9.7	1.9	3.8	2.0	0.7
Elsewhere in the firm .....	1,099	34.8	9.8	13.0	2.0	6.1	3.9	3.4
Outside the firm .....	3,506	27.4	7.6	10.7	3.1	4.4	1.5	2.0
No formal training for staff conducted ..	5,251	11.1	2.1	5.7	0.8	1.8	0.7	1.2
Not specified .....	3,686	1.2	0.1	0.7	-	0.3	0.1	0.3
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	23.7	6.9	9.4	1.7	3.9	1.8	0.7
Staff from outside the plant .....	1,637	37.5	12.5	14.1	2.8	4.9	3.2	2.9
Trainers from outside the firm .....	5,287	32.4	10.2	12.0	3.8	4.0	2.5	1.7
Not specified .....	9,115	7.2	1.4	3.3	0.4	1.4	0.7	0.7
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	19.9	6.5	7.4	1.6	3.2	1.3	0.9
Some problems .....	19,836	26.4	7.7	10.4	1.8	4.2	2.3	0.9
Very difficult .....	5,401	24.2	5.6	10.8	2.7	3.4	1.6	1.8
Not specified .....	3,849	1.3	-	0.6	0.3	0.2	0.2	0.4
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	36.8	9.8	15.1	3.4	5.6	2.9	1.8
No .....	34,703	22.2	6.6	8.8	1.7	3.5	1.7	0.6
Don't know .....	1,447	29.8	9.5	10.7	2.8	4.4	2.5	2.3
Not specified .....	3,576	0.5	0.1	0.5	-	-	-	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 9E. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: INTERCOMPANY COMPUTER NETWORKS LINKING PLANTS TO SUBCONTRACTORS, SUPPLIERS, OR CUSTOMERS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within			Not specified	
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use		
All establishments. . . . .	42,991	17.7	-	7.4	6.0	3.6	0.7	8.3	10.3	52.8	10.9	0.5
Major Group:												
34, Fabricated Metal Products. . . . .	13,190	16.6	-	6.9	5.4	3.9	0.4	8.0	8.1	54.9	12.3	1.1
35, Industrial Machinery and Equipment . . . . .	14,231	15.5	-	6.6	5.7	2.7	0.5	7.5	12.5	55.0	9.5	1.0
36, Electronic and Other Electric Equipment. . . . .	7,472	22.0	-	9.7	6.4	4.6	1.3	9.8	10.4	46.5	11.4	1.0
37, Transportation Equipment . . . . .	4,110	23.5	-	8.0	9.0	5.0	1.5	7.0	10.2	48.6	10.8	1.2
38, Instruments and Related Products. . . . .	3,988	15.4	-	6.8	5.3	2.2	1.1	10.2	9.9	54.0	10.5	1.0
Employment size:												
20 to 99. . . . .	30,502	12.1	-	5.3	3.8	2.4	0.6	6.7	9.6	59.8	11.9	0.7
100 to 499. . . . .	10,321	28.5	-	12.0	10.1	5.3	1.1	12.4	12.2	38.6	8.3	0.7
500 and over. . . . .	2,168	47.1	-	15.3	17.6	12.5	1.7	11.1	11.0	21.9	8.9	0.8
Age of plant (years):												
Less than 5 . . . . .	4,893	15.0	-	6.9	4.4	2.0	1.7	9.7	12.8	58.8	3.7	1.4
5 to 15. . . . .	13,722	18.0	-	8.0	5.4	4.0	0.6	8.9	12.1	57.6	3.4	1.0
16 to 30. . . . .	11,303	20.5	-	8.1	7.1	4.5	0.8	9.4	11.3	55.2	3.6	1.1
Over 30 . . . . .	9,310	21.9	-	8.6	8.7	4.0	0.6	8.3	9.3	56.9	3.6	1.1
Not specified . . . . .	3,763	0.9	-	0.5	0.3	0.1	-	0.3	0.3	10.6	87.9	0.5
Manufacturing process:												
Fabrication/machining. . . . .	6,795	16.3	-	6.6	5.3	3.8	0.6	7.7	12.8	59.6	3.6	1.4
Assembly. . . . .	6,388	20.7	-	9.7	5.9	4.5	0.6	9.9	10.6	55.4	3.5	1.1
Both. . . . .	23,393	20.6	-	8.5	7.2	3.9	1.0	9.5	11.5	55.5	3.0	0.8
Neither. . . . .	2,577	12.3	-	4.8	3.8	3.0	0.7	6.2	7.8	66.1	7.6	1.9
Not specified . . . . .	3,838	1.4	-	0.1	1.1	0.2	-	0.5	0.2	11.2	86.8	0.5
Market for most products:												
Consumer . . . . .	4,358	20.7	-	8.6	6.2	4.9	1.0	9.8	10.0	54.3	5.3	1.6
Commercial . . . . .	5,791	18.6	-	9.4	6.1	2.5	0.6	10.8	12.2	55.2	3.1	1.5
Industrial . . . . .	18,796	18.2	-	7.8	6.0	3.5	0.9	9.0	10.9	58.7	3.3	0.9
Transportation . . . . .	3,974	32.2	-	10.4	12.9	8.1	0.8	6.8	12.3	46.2	2.5	1.9
Government. . . . .	2,141	15.6	-	5.9	5.3	3.8	0.6	7.8	14.2	58.6	3.9	1.6
Other . . . . .	3,679	13.6	-	5.4	4.9	2.6	0.7	8.6	11.4	62.9	3.4	1.5
Not specified . . . . .	4,252	2.1	-	1.1	0.4	0.3	0.3	1.4	1.0	16.5	79.1	0.4
Market price for most products:												
Less than \$5 . . . . .	5,274	26.2	-	8.7	10.3	6.4	0.8	11.3	9.1	50.0	3.5	1.7
\$5 to \$100 . . . . .	10,422	22.3	-	9.7	7.1	4.4	1.1	10.2	10.9	53.0	3.6	1.2
\$101 to \$1,000 . . . . .	8,846	16.4	-	7.7	4.4	3.7	0.6	8.4	12.1	60.4	2.7	1.2
\$1,001 to \$2,000 . . . . .	2,023	16.2	-	6.2	7.0	1.5	1.5	6.2	13.4	61.5	2.7	1.8
\$2,001 to \$10,000 . . . . .	4,265	14.9	-	7.1	4.5	2.6	0.7	6.9	12.1	62.7	3.4	1.5
Over \$10,000. . . . .	7,340	18.5	-	7.7	6.9	3.4	0.5	8.8	12.0	57.6	3.0	1.2
Not specified . . . . .	4,821	2.5	-	0.5	1.3	0.4	0.3	1.9	1.7	21.7	72.1	0.8
Products made to military specifications:												
Yes . . . . .	14,112	21.1	-	9.4	7.2	3.6	0.9	10.7	13.7	51.8	2.7	1.0
No . . . . .	22,214	19.0	-	7.7	6.3	4.3	0.7	7.9	10.3	58.7	4.0	0.8
Don't know . . . . .	2,939	12.4	-	4.1	4.7	2.3	1.3	9.4	6.9	67.4	3.9	1.3
Not specified . . . . .	3,726	0.7	-	0.1	0.4	0.1	0.1	0.1	0.3	10.2	88.8	0.3
Percent, on an annual basis, of all products manufactured at the plant, that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	24.4	-	10.7	8.4	4.6	0.7	10.1	15.1	47.9	2.5	1.3
26 to 75 percent . . . . .	2,499	14.6	-	8.4	3.1	2.8	0.3	9.6	15.9	57.8	2.2	1.6
Over 75 percent. . . . .	1,148	22.2	-	9.5	8.2	4.1	0.4	8.5	11.8	55.1	2.4	4.2
None . . . . .	11,808	15.2	-	6.3	5.4	2.8	0.7	7.1	8.9	64.7	4.0	0.9
Don't know . . . . .	13,573	19.6	-	7.4	6.5	4.5	1.2	9.9	9.8	56.8	3.8	0.9
Not specified . . . . .	4,029	2.6	-	0.8	1.4	0.3	0.1	0.4	0.4	12.9	83.6	0.7

See footnotes at the end of the table.



Table 9E. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: INTERCOMPANY COMPUTER NETWORKS LINKING PLANTS TO SUBCONTRACTORS, SUPPLIERS, OR CUSTOMERS—Continued**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within			Not specified	
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use		
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	14.3	-	5.9	5.1	2.7	0.6	6.5	9.6	65.0	4.6	1.0
Less than 10 percent .....	15,360	22.2	-	9.3	7.5	4.7	0.7	10.4	12.1	52.2	3.1	0.9
10 to 19 percent .....	4,737	22.3	-	9.3	7.7	4.0	1.3	8.8	14.1	52.8	1.9	1.4
20 to 49 percent .....	3,912	20.8	-	9.5	6.0	4.3	1.0	11.9	12.1	52.3	2.9	1.5
50 percent or more .....	1,398	20.6	-	5.5	8.7	4.6	1.8	11.7	6.2	59.0	2.6	2.3
Not specified .....	3,897	1.8	-	1.0	0.3	0.4	0.1	0.5	1.0	10.7	86.0	0.5
Where is most of the research and development work for the plant done:												
Outside the firm .....	1,834	17.1	-	4.9	4.7	6.9	0.6	10.2	7.5	63.6	1.6	2.9
In the plant .....	25,416	18.3	-	8.2	6.3	3.0	0.8	9.6	12.0	56.3	3.8	0.7
Elsewhere in the firm .....	4,969	36.6	-	11.9	12.5	10.8	1.4	9.4	11.7	39.6	2.8	1.7
No research and development done .....	7,046	11.5	-	5.9	3.7	1.4	0.5	6.4	9.3	69.7	3.1	1.4
Not specified .....	3,726	0.1	-	-	-	-	0.1	-	0.5	9.8	89.6	0.1
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	19.7	-	8.3	6.6	4.0	0.8	9.0	11.7	56.0	3.7	0.7
Elsewhere in the firm .....	1,099	40.4	-	8.5	16.7	13.7	1.5	14.6	9.6	33.6	1.7	3.9
Outside the firm .....	3,506	23.1	-	10.9	6.8	4.7	0.7	12.2	15.4	46.7	2.6	2.0
No formal training for staff .....	5,251	10.2	-	4.4	4.0	0.9	0.9	5.5	6.7	74.3	3.3	1.2
Not specified .....	3,686	0.4	-	0.2	-	0.2	-	0.4	0.2	8.6	90.4	0.1
Who conducts most of the formal training for the staff:												
Staff from inside the plant .....	26,952	18.4	-	8.0	6.0	3.8	0.6	8.5	11.4	57.8	3.9	0.7
Staff from outside the plant .....	1,637	39.3	-	10.1	14.2	12.9	2.1	12.7	11.3	35.0	1.6	3.0
Trainers from outside the firm .....	5,287	25.9	-	11.3	9.2	4.6	0.8	14.1	15.2	42.9	1.9	1.6
Not specified .....	9,115	6.7	-	2.7	2.6	0.6	0.8	3.4	4.1	47.1	38.7	0.7
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	14.8	-	6.1	4.7	3.6	0.4	8.1	8.6	65.1	3.3	0.8
Some problems .....	19,836	21.8	-	8.7	8.0	4.1	1.0	9.7	12.3	52.9	3.3	0.8
Very difficult .....	5,401	21.7	-	11.0	5.8	3.8	1.1	8.9	14.5	50.6	4.2	1.8
Not specified .....	3,849	0.9	-	-	0.4	0.3	0.2	0.3	0.5	11.2	87.0	0.4
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	27.2	-	9.1	11.4	5.8	0.9	12.8	13.8	43.7	2.5	1.7
No .....	34,703	18.0	-	7.7	5.9	3.6	0.8	8.6	11.0	58.7	3.6	0.6
Don't know .....	1,447	30.1	-	13.3	10.2	5.6	1.0	9.5	11.1	46.3	3.1	2.5
Not specified .....	3,576	0.2	-	0.1	-	0.1	-	0.1	0.1	6.9	92.8	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 9F. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: INTERCOMPANY COMPUTER NETWORKS LINKING PLANTS TO SUBCONTRACTORS, SUPPLIERS, OR CUSTOMERS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	17.7	4.8	4.5	2.0	4.9	1.5	0.5
Major Group:								
34, Fabricated Metal Products.....	13,190	16.7	3.5	4.3	2.3	5.2	1.3	1.1
35, Industrial Machinery and Equipment.....	14,231	15.4	4.7	3.8	1.8	4.1	1.0	1.0
36, Electronic and Other Electric Equipment.....	7,472	21.9	6.4	5.8	2.0	5.8	1.9	1.0
37, Transportation Equipment.....	4,110	23.4	6.4	6.5	1.9	6.4	2.1	1.2
38, Instruments and Related Products.....	3,988	15.4	4.7	3.6	1.5	3.6	2.1	1.0
Employment size:								
20 to 99.....	30,502	12.0	3.1	2.8	1.4	3.5	1.0	0.7
100 to 499.....	10,321	28.3	7.7	7.6	2.7	7.8	2.4	0.7
500 and over.....	2,168	47.1	14.8	13.4	6.0	9.9	3.2	0.8
Age of plant (years):								
Less than 5.....	4,893	15.0	4.2	4.1	1.2	3.6	1.9	1.4
5 to 15.....	13,722	18.0	5.0	4.2	2.1	5.5	1.3	1.0
16 to 30.....	11,303	20.5	6.0	4.9	2.5	5.1	2.0	1.1
Over 30.....	9,310	22.0	5.3	6.6	2.4	6.4	1.4	1.1
Not specified.....	3,763	0.9	0.2	-	-	0.3	0.4	0.5
Manufacturing process:								
Fabrication/machining.....	6,795	16.3	5.2	3.9	1.3	4.8	1.2	1.4
Assembly.....	6,388	20.7	6.4	5.5	2.5	5.0	1.3	1.1
Both.....	23,393	20.5	5.2	5.5	2.2	5.9	1.8	0.8
Neither.....	2,577	12.3	2.8	2.0	2.9	2.9	1.7	1.9
Not specified.....	3,838	1.3	0.4	0.3	0.1	0.3	0.3	0.5
Market for most products:								
Consumer.....	4,358	20.6	5.5	4.8	2.6	5.9	1.8	1.6
Commercial.....	5,791	18.7	5.3	5.8	2.2	4.4	1.0	1.5
Industrial.....	18,796	18.2	4.8	4.5	2.3	5.0	1.6	0.9
Transportation.....	3,974	32.2	8.5	7.7	2.4	10.7	2.9	1.9
Government.....	2,141	15.7	5.0	4.7	1.7	3.0	1.3	1.6
Other.....	3,679	13.6	4.3	3.0	1.2	4.2	0.9	1.5
Not specified.....	4,252	2.0	0.3	1.0	0.1	0.1	0.6	0.4
Market price for most products:								
Less than \$5.....	5,274	26.1	5.9	5.5	4.1	8.5	2.1	1.7
\$5 to \$100.....	10,422	22.3	5.9	5.4	2.3	6.5	2.3	1.2
\$101 to \$1,000.....	8,846	16.4	5.0	3.6	1.7	4.9	1.1	1.2
\$1,001 to \$2,000.....	2,023	16.2	2.8	6.0	1.3	4.6	1.4	1.8
\$2,001 to \$10,000.....	4,265	14.9	3.9	5.7	1.4	2.8	1.2	1.5
Over \$10,000.....	7,340	18.5	6.2	4.9	2.1	4.2	1.2	1.2
Not specified.....	4,821	2.6	0.5	1.1	0.1	0.5	0.4	0.8
Products made to military specifications:								
Yes.....	14,112	21.1	5.5	5.7	2.0	6.0	1.9	1.0
No.....	22,214	19.1	5.5	4.8	2.2	5.3	1.4	0.8
Don't know.....	2,939	12.5	2.7	2.9	2.2	2.6	2.0	1.3
Not specified.....	3,726	0.6	-	0.1	0.1	0.3	0.2	0.3
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies that are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	24.3	6.8	6.4	2.2	7.0	1.9	1.3
26 to 75 percent.....	2,499	14.6	4.2	4.9	1.8	3.3	0.4	1.6
Over 75 percent.....	1,148	22.2	4.3	4.7	1.1	10.8	1.3	4.2
None.....	11,808	15.2	4.0	4.0	1.9	4.0	1.3	0.9
Don't know.....	13,573	19.7	5.5	4.9	2.5	5.1	1.8	0.9
Not specified.....	4,029	2.6	0.6	0.2	0.3	0.8	0.7	0.7

See footnotes at the end of the table.

Table 9F. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: INTERCOMPANY COMPUTER NETWORKS LINKING PLANTS TO SUBCONTRACTORS, SUPPLIERS, OR CUSTOMERS**—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	14.3	3.5	3.7	1.8	4.0	1.3	1.0
Less than 10 percent .....	15,360	22.2	6.0	5.9	2.6	6.6	1.3	0.9
10 to 19 percent .....	4,737	22.4	7.9	5.2	2.3	5.1	1.9	1.4
20 to 49 percent .....	3,912	20.8	4.9	5.7	2.0	5.2	3.0	1.5
50 percent or more .....	1,398	20.5	7.1	4.9	1.4	5.2	1.9	2.3
Not specified .....	3,897	1.7	0.1	0.3	-	0.5	0.7	0.5
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	17.1	4.3	2.1	4.3	4.3	2.2	2.9
In this plant .....	25,416	18.3	5.0	4.9	2.2	4.8	1.4	0.7
Elsewhere in the firm .....	4,969	36.5	10.3	10.0	3.1	10.0	3.1	1.7
No research and development done ..	7,046	11.5	2.9	2.5	0.8	4.4	1.0	1.4
Not specified .....	3,726	0.1	-	-	-	-	0.1	0.1
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	19.7	5.4	5.0	2.3	5.3	1.6	0.7
Elsewhere in the firm .....	1,099	40.5	12.7	10.6	3.5	10.8	2.8	3.9
Outside the firm .....	3,506	23.1	5.4	6.9	2.4	7.4	1.1	2.0
No formal training for staff conducted ..	5,251	10.2	2.7	2.0	0.8	2.9	1.8	1.2
Not specified .....	3,686	0.4	-	0.1	-	-	0.2	0.1
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	18.5	5.4	4.7	2.2	4.9	1.4	0.7
Staff from outside the plant .....	1,637	39.4	10.3	9.6	4.8	11.1	3.5	3.0
Trainers from outside the firm .....	5,287	25.9	6.0	7.9	2.6	7.8	1.5	1.6
Not specified .....	9,115	6.7	1.4	1.3	0.5	2.1	1.4	0.7
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	14.9	4.1	4.1	1.7	4.0	1.1	0.8
Some problems .....	19,836	21.8	6.1	5.5	2.4	5.8	2.1	0.8
Very difficult .....	5,401	21.8	5.5	5.4	2.5	7.1	1.4	1.8
Not specified .....	3,849	0.9	-	0.2	0.1	0.6	-	0.4
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	27.2	9.1	6.4	3.4	6.5	1.8	1.7
No .....	34,703	18.1	4.8	4.7	2.0	5.1	1.5	0.6
Don't know .....	1,447	29.9	7.9	8.6	3.0	7.5	2.8	2.5
Not specified .....	3,576	0.1	-	0.1	-	-	0.1	0.1

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 9G. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: PROGRAMMABLE CONTROLLERS

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments . . . . .	42,991	29.9	214,378	5.0	10.1	13.2	1.6	3.7	4.7	51.0	10.8	0.6
Major Group:												
34, Fabricated Metal Products . . . . .	13,190	30.1	49,045	4.9	10.9	12.6	1.7	3.2	4.2	50.8	11.6	1.3
35, Industrial Machinery and Equipment . . . . .	14,231	29.0	41,937	4.6	10.1	12.8	1.5	4.3	5.5	51.5	9.8	1.2
36, Electronic and Other Electric Equipment. . . . .	7,472	30.7	48,504	5.6	9.2	14.4	1.5	3.5	5.0	49.3	11.4	1.1
37, Transportation Equipment . . . . .	4,110	30.6	54,063	4.5	9.0	15.8	1.3	3.2	3.1	51.8	11.2	1.3
38, Instruments and Related Products . . . . .	3,988	29.9	20,829	5.8	10.0	12.1	2.0	4.4	4.2	51.7	10.0	1.4
Employment size:												
20 to 99 . . . . .	30,502	20.5	32,796	4.1	7.3	7.9	1.2	3.6	5.0	59.0	11.9	0.8
100 to 499 . . . . .	10,321	49.1	69,142	7.7	16.8	22.2	2.4	4.5	4.2	34.2	8.0	0.8
500 and over . . . . .	2,168	69.8	112,440	4.4	17.0	45.5	2.9	2.4	1.9	16.9	8.9	0.7
Age of plant (years):												
Less than 5 . . . . .	4,893	25.6	13,121	7.5	11.5	4.9	1.7	4.6	5.3	61.1	3.3	1.8
5 to 15 . . . . .	13,722	30.3	54,725	5.1	9.6	14.1	1.5	4.1	5.1	56.7	3.8	1.2
16 to 30 . . . . .	11,303	33.1	56,933	5.8	10.6	15.2	1.5	3.6	5.0	54.9	3.4	1.3
Over 30 . . . . .	9,310	39.0	88,896	4.6	13.3	19.2	1.9	4.3	5.1	48.8	2.7	1.4
Not specified . . . . .	3,763	1.4	702	0.1	-	0.2	1.1	0.2	0.2	10.3	87.9	0.7
Manufacturing process:												
Fabrication/machining . . . . .	6,795	29.5	21,976	4.2	10.7	13.1	1.5	3.4	5.7	57.9	3.5	1.9
Assembly . . . . .	6,388	25.2	33,866	6.2	8.4	9.4	1.2	3.8	4.0	64.4	2.7	1.2
Both . . . . .	23,393	36.1	152,362	5.5	12.0	16.6	2.0	4.6	5.6	50.8	3.0	0.9
Neither . . . . .	2,577	29.7	5,926	6.4	10.1	12.1	1.1	1.3	2.2	59.2	7.5	3.0
Not specified . . . . .	3,838	3.0	248	0.3	0.8	0.7	1.2	1.4	0.6	34.3	60.7	0.3
Market for most products:												
Consumer . . . . .	4,358	35.3	45,574	4.0	15.6	13.6	2.1	3.6	7.2	49.0	4.9	1.9
Commercial . . . . .	5,791	30.2	19,686	6.2	9.5	13.4	1.1	5.2	4.5	56.5	3.6	1.7
Industrial . . . . .	18,796	32.3	67,601	5.6	10.8	14.4	1.5	4.0	5.0	55.9	2.8	1.1
Transportation . . . . .	3,974	44.3	56,854	7.8	13.9	20.2	2.4	3.6	3.7	45.3	3.1	2.1
Government . . . . .	2,141	29.2	7,121	4.7	8.8	14.3	1.4	4.2	5.4	57.4	3.7	2.3
Other . . . . .	3,679	24.2	14,467	3.5	8.1	11.1	1.5	3.3	5.4	63.8	3.4	1.7
Not specified . . . . .	4,252	5.6	3,073	0.5	1.0	2.4	1.7	0.6	0.7	14.4	78.8	1.1
Market price for most products:												
Less than \$5 . . . . .	5,274	45.0	46,919	8.1	16.1	18.9	1.9	3.5	3.8	45.0	2.8	2.0
\$5 to \$100 . . . . .	10,422	36.1	69,073	6.8	11.9	15.4	2.0	4.6	5.5	50.6	3.2	1.4
\$101 to \$1,000 . . . . .	8,846	30.5	43,064	5.5	9.9	13.2	1.9	4.0	6.3	56.5	2.7	1.5
\$1,001 to \$2,000 . . . . .	2,023	23.5	4,490	4.0	9.2	9.8	0.5	3.8	5.4	64.7	2.5	2.4
\$2,001 to \$10,000 . . . . .	4,265	24.5	11,807	4.6	8.1	10.4	1.4	4.5	4.9	62.9	3.2	1.7
Over \$10,000 . . . . .	7,340	30.0	35,960	3.3	9.3	15.7	1.7	4.0	4.5	59.1	2.4	1.4
Not specified . . . . .	4,821	6.1	3,066	0.1	3.0	2.6	0.4	0.5	0.5	19.3	73.6	1.0
Products made to military specifications:												
Yes . . . . .	14,112	36.3	83,753	7.1	10.5	16.8	1.9	5.3	5.8	49.8	2.9	1.2
No . . . . .	22,214	30.9	114,086	4.7	11.2	13.5	1.5	3.3	5.0	57.1	3.7	0.9
Don't know . . . . .	2,939	28.8	16,291	3.3	12.6	10.8	2.1	4.2	2.1	61.4	3.5	2.4
Not specified . . . . .	3,726	0.5	247	-	-	0.1	0.4	0.1	0.6	10.1	88.7	0.2
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	38.4	69,568	6.9	12.4	17.5	1.6	4.8	5.2	49.2	2.5	1.5
26 to 75 percent . . . . .	2,499	29.6	5,608	4.8	11.0	11.3	2.5	4.9	10.2	52.6	2.7	2.9
Over 75 percent . . . . .	1,148	31.6	4,199	8.0	7.8	14.9	0.9	2.7	3.1	60.6	2.0	4.1
None . . . . .	11,808	28.9	57,296	4.8	10.1	12.7	1.3	2.7	3.9	60.4	4.2	1.2
Don't know . . . . .	13,573	32.2	76,435	4.9	10.7	14.5	2.1	4.8	5.3	54.4	3.3	1.1
Not specified . . . . .	4,029	3.9	1,272	0.5	2.1	0.7	0.6	-	0.4	12.4	83.2	1.0

See footnotes at the end of the table.

Table 9G. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: PROGRAMMABLE CONTROLLERS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	24.4	43,058	4.6	8.0	10.2	1.6	3.6	4.3	63.1	4.6	1.3
Less than 10 percent .....	15,360	36.6	102,239	6.1	11.9	16.9	1.7	4.8	5.6	50.4	2.7	1.1
10 to 19 percent .....	4,737	39.1	29,059	6.8	13.8	16.5	2.0	3.2	5.0	51.0	1.8	1.8
20 to 49 percent .....	3,912	36.9	25,169	4.4	13.4	17.5	1.6	4.1	6.9	49.7	2.3	1.8
50 percent or more .....	1,398	34.8	12,862	4.9	15.1	12.9	1.9	4.5	2.5	55.3	2.9	2.9
Not specified .....	3,897	3.1	1,990	0.5	0.7	1.4	0.5	0.2	0.4	10.2	86.3	0.5
Where is most of the research and development work for the plant done:												
Outside the firm. ....	1,834	27.1	7,129	5.8	6.7	13.2	1.4	2.7	6.0	62.6	1.6	3.3
In the plant .....	25,416	33.2	109,959	5.7	11.9	13.7	1.9	4.6	5.7	53.0	3.5	0.8
Elsewhere in the firm. ....	4,969	56.8	88,930	7.5	17.2	29.3	2.8	2.7	2.7	35.6	2.2	1.9
No research and development done .....	7,046	15.1	6,968	2.9	4.7	7.1	0.4	3.4	4.2	73.7	3.7	1.6
Not specified .....	3,726	1.3	1,392	-	0.3	0.7	0.3	0.1	0.5	8.6	89.5	0.6
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	33.6	175,026	5.4	11.6	14.9	1.7	4.3	5.3	53.4	3.5	0.8
Elsewhere in the firm. ....	1,099	58.6	15,024	4.4	14.2	37.5	2.5	5.1	3.9	30.7	1.6	4.0
Outside the firm. ....	3,506	39.2	17,199	7.8	12.6	16.0	2.8	5.3	7.3	45.7	2.5	2.4
No formal training for staff ...	5,251	17.0	6,402	4.4	5.8	5.8	1.0	1.6	2.6	75.6	3.3	1.6
Not specified .....	3,686	1.4	726	0.1	0.4	0.6	0.3	0.7	0.3	7.4	90.1	0.4
Who conducts most of the formal training for the staff:												
Staff from inside the plant. ....	26,952	31.1	141,741	5.3	10.8	13.5	1.5	4.1	5.4	55.7	3.7	0.8
Staff from outside the plant. ....	1,637	62.0	24,790	7.3	15.8	34.8	4.1	5.5	2.7	28.6	1.2	3.1
Trainers from outside the firm .....	5,287	46.6	39,331	7.0	15.6	21.5	2.5	5.9	5.9	39.7	1.9	2.0
Not specified .....	9,115	11.0	8,515	2.6	3.6	3.8	1.0	1.0	2.0	47.5	38.5	1.0
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	26.2	64,155	5.1	9.0	11.3	0.8	3.7	3.5	63.2	3.4	1.1
Some problems .....	19,836	36.0	118,101	5.6	12.0	15.9	2.5	4.0	5.6	51.7	2.9	1.0
Very difficult .....	5,401	37.8	31,833	5.9	12.9	17.7	1.3	5.5	7.3	45.0	4.3	2.2
Not specified .....	3,849	1.3	289	0.2	0.3	0.5	0.3	-	0.3	11.1	87.2	0.4
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	49.3	34,201	7.6	17.3	22.1	2.3	2.9	3.2	42.2	2.5	2.0
No .....	34,703	30.1	161,420	5.1	10.2	13.2	1.6	4.1	5.4	57.0	3.4	0.7
Don't know .....	1,447	54.6	18,669	8.6	16.0	26.2	3.8	4.6	1.9	35.1	3.9	3.3
Not specified .....	3,576	0.3	88	-	0.1	-	0.2	0.2	0.3	6.3	92.8	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 9H. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: PROGRAMMABLE CONTROLLERS

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology: (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments .....	42,991	29.9	11.1	9.9	2.6	3.4	2.8	0.6
Major Group:								
34, Fabricated Metal Products .....	13,190	30.2	10.4	11.2	2.7	3.0	2.9	1.3
35, Industrial Machinery and Equipment .....	14,231	29.0	10.5	10.2	2.3	3.1	3.0	1.2
36, Electronic and Other Electric Equipment .....	7,472	30.7	13.1	8.4	3.0	3.6	2.6	1.1
37, Transportation Equipment .....	4,110	30.7	10.7	10.1	2.2	5.3	2.4	1.3
38, Instruments and Related Products .....	3,988	29.8	12.3	7.1	3.5	3.6	3.2	1.4
Employment size:								
20 to 99 .....	30,502	20.5	7.7	6.8	1.7	2.3	2.1	0.8
100 to 499 .....	10,321	48.9	18.3	16.3	4.2	5.4	4.6	0.8
500 and over .....	2,168	69.8	24.5	23.1	8.8	9.3	4.3	0.7
Age of plant (years):								
Less than 5 .....	4,893	25.6	10.8	7.2	1.8	2.8	3.1	1.8
5 to 15 .....	13,722	30.4	11.5	10.7	2.1	3.2	2.9	1.2
16 to 30 .....	11,303	33.1	12.8	11.1	3.0	3.4	2.8	1.3
Over 30 .....	9,310	39.1	13.3	12.6	4.4	5.3	3.4	1.4
Not specified .....	3,763	1.4	-	0.3	-	0.1	1.0	0.7
Manufacturing process:								
Fabrication/machining .....	6,795	29.5	12.7	8.8	1.9	2.5	3.7	1.9
Assembly .....	6,388	25.1	9.8	7.2	2.3	3.4	2.3	1.2
Both .....	23,393	36.0	12.6	12.8	3.4	4.1	3.2	0.9
Neither .....	2,577	29.9	12.7	7.4	2.4	4.4	3.0	3.0
Not specified .....	3,838	1.0	0.2	0.3	0.1	0.1	0.3	0.3
Market for most products:								
Consumer .....	4,358	35.2	13.2	10.0	3.8	5.2	3.0	1.9
Commercial .....	5,791	30.2	11.4	10.4	3.6	2.9	1.9	1.7
Industrial .....	18,796	32.2	12.0	11.6	2.5	3.3	2.8	1.1
Transportation .....	3,974	44.3	15.3	14.3	2.7	7.2	4.8	2.1
Government .....	2,141	29.3	12.3	7.6	5.1	2.2	2.1	2.3
Other .....	3,679	24.1	9.7	6.7	1.5	2.9	3.4	1.7
Not specified .....	4,252	5.5	1.4	1.2	0.4	0.2	2.3	1.1
Market price for most products:								
Less than \$5 .....	5,274	45.0	16.1	15.2	4.7	5.2	3.8	2.0
\$5 to \$100 .....	10,422	36.1	13.8	11.5	3.2	3.9	3.6	1.4
\$101 to \$1,000 .....	8,846	30.6	12.1	9.2	2.0	3.8	3.4	1.5
\$1,001 to \$2,000 .....	2,023	23.5	8.1	8.4	3.0	2.9	1.2	2.4
\$2,001 to \$10,000 .....	4,265	24.5	7.2	10.0	2.5	2.9	2.0	1.7
Over \$10,000 .....	7,340	30.0	11.2	10.1	2.5	3.1	3.0	1.4
Not specified .....	4,821	6.1	2.8	2.0	0.5	0.6	0.2	1.0
Products made to military specifications:								
Yes .....	14,112	36.2	13.8	11.7	3.7	3.4	3.6	1.2
No .....	22,214	31.0	11.7	10.4	2.4	3.6	2.8	0.9
Don't know .....	2,939	28.8	7.9	9.7	2.4	6.0	2.8	2.4
Not specified .....	3,726	0.4	0.1	0.2	-	-	0.2	0.2
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies that are prime contractors to Federal Defense Agencies:								
1 to 25 percent .....	9,934	38.4	13.9	14.0	3.3	3.6	3.7	1.5
26 to 75 percent .....	2,499	29.7	11.1	9.4	4.1	2.5	2.6	2.9
Over 75 percent .....	1,148	31.5	16.4	7.3	3.4	1.3	3.1	4.1
None .....	11,808	28.8	11.2	8.9	2.6	3.6	2.6	1.2
Don't know .....	13,573	32.2	11.6	10.5	2.7	4.2	3.1	1.1
Not specified .....	4,029	3.9	0.9	1.6	-	0.7	0.7	1.0

See footnotes at the end of the table.



Table 9H. PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: PROGRAMMABLE CONTROLLERS—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology: (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	24.4	10.0	7.3	2.3	2.1	2.7	1.3
Less than 10 percent .....	15,360	36.6	12.3	13.4	3.1	4.8	3.0	1.1
10 to 19 percent .....	4,737	39.1	15.0	12.6	3.8	3.7	4.1	1.8
20 to 49 percent .....	3,912	37.0	15.1	10.7	3.5	4.7	3.1	1.8
50 percent or more .....	1,398	34.6	13.9	10.3	2.1	4.1	4.3	2.9
Not specified .....	3,897	3.0	1.1	0.9	0.2	0.4	0.4	0.5
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	27.0	9.7	6.7	4.3	2.5	3.9	3.3
In this plant .....	25,416	33.1	12.8	10.9	2.9	3.5	3.1	0.8
Elsewhere in the firm .....	4,969	56.8	20.0	18.7	5.0	8.4	4.8	1.9
No research and development done ..	7,046	15.1	4.7	5.8	1.1	1.7	1.7	1.6
Not specified .....	3,726	1.3	0.7	0.3	-	-	0.2	0.6
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	33.6	12.8	11.1	3.1	3.6	3.0	0.8
Elsewhere in the firm .....	1,099	58.6	21.3	21.9	3.2	8.1	4.1	4.0
Outside the firm .....	3,506	39.2	12.1	13.9	3.0	5.7	4.5	2.4
No formal training for staff conducted ..	5,251	17.0	6.6	4.8	1.6	2.0	2.0	1.6
Not specified .....	3,686	1.4	0.3	0.5	-	0.3	0.4	0.4
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	31.1	12.0	10.2	2.9	3.2	2.8	0.8
Staff from outside the plant .....	1,637	62.0	20.9	22.0	4.2	10.0	5.0	3.1
Trainers from outside the firm .....	5,287	46.6	16.1	16.5	3.5	6.1	4.4	2.0
Not specified .....	9,115	11.0	4.0	3.0	1.1	1.2	1.7	1.0
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	26.2	10.5	8.7	2.5	3.0	1.5	1.1
Some problems .....	19,836	35.9	12.8	11.5	3.2	4.0	4.4	1.0
Very difficult .....	5,401	37.8	14.6	13.7	2.9	4.3	2.4	2.2
Not specified .....	3,849	1.3	0.1	0.6	0.1	0.2	0.3	0.4
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	49.2	18.7	16.2	4.8	4.9	4.5	2.0
No .....	34,703	30.1	11.3	10.0	2.6	3.3	2.9	0.7
Don't know .....	1,447	54.6	17.8	17.7	5.6	9.4	4.0	3.3
Not specified .....	3,576	0.4	0.1	0.3	-	-	0.1	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 9I. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: COMPUTERS USED FOR CONTROL ON THE FACTORY FLOOR

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
All establishments . . . . .	42,991	26.5	95,865	7.0	9.8	8.5	1.2	9.1	8.5	45.4	10.4	0.6
Major Group:												
34, Fabricated Metal Products . . . . .	13,190	20.2	12,226	6.1	6.8	6.2	1.1	9.2	9.6	49.7	11.3	1.1
35, Industrial Machinery and Equipment . . . . .	14,231	28.1	21,953	7.4	10.8	8.8	1.1	9.1	8.4	45.1	9.4	1.2
36, Electronic and Other Electric Equipment. . . . .	7,472	33.2	28,401	7.4	12.3	12.0	1.5	9.9	7.8	38.5	10.7	1.2
37, Transportation Equipment . . . . .	4,110	26.9	22,933	7.8	10.0	7.8	1.3	8.2	7.5	46.6	10.8	1.2
38, Instruments and Related Products . . . . .	3,988	29.1	10,352	6.5	11.5	9.4	1.7	8.7	7.6	44.5	10.3	1.3
Employment size:												
20 to 99. . . . .	30,502	18.9	19,569	5.8	6.7	5.5	0.9	9.0	8.7	52.0	11.4	0.8
100 to 499. . . . .	10,321	41.8	34,132	9.9	16.8	13.1	2.0	10.1	8.6	31.6	7.8	0.8
500 and over. . . . .	2,168	62.8	42,164	10.1	21.3	28.6	2.8	5.6	5.0	18.1	8.5	0.8
Age of plant (years):												
Less than 5. . . . .	4,893	27.4	7,234	11.4	9.6	4.4	2.0	13.1	9.1	47.9	2.5	1.9
5 to 15. . . . .	13,722	28.3	24,816	8.3	10.0	8.8	1.2	10.7	9.2	48.7	3.1	1.2
16 to 30. . . . .	11,303	29.3	36,831	6.5	11.1	10.5	1.2	8.9	9.7	48.9	3.1	1.3
Over 30. . . . .	9,310	30.7	26,679	6.0	12.1	11.1	1.5	8.2	9.0	49.3	2.8	1.2
Not specified. . . . .	3,763	0.5	307	0.2	-	0.2	0.1	1.0	0.1	10.5	87.9	0.2
Manufacturing process:												
Fabrication/machining. . . . .	6,795	26.6	9,863	6.5	11.1	7.5	1.5	10.0	9.6	51.3	2.5	1.9
Assembly. . . . .	6,388	28.5	26,432	8.2	10.0	9.2	1.1	9.4	7.8	51.8	2.6	1.3
Both. . . . .	23,393	30.8	57,031	8.0	11.4	10.1	1.3	10.6	9.8	46.0	2.8	0.9
Neither. . . . .	2,577	21.0	2,506	5.9	5.8	7.4	1.9	4.8	7.8	59.8	6.6	2.4
Not specified. . . . .	3,838	3.9	34	0.6	1.9	0.5	0.9	2.3	0.7	33.1	59.9	0.5
Market for most products:												
Consumer . . . . .	4,358	25.2	9,833	7.0	10.1	7.0	1.1	10.8	10.1	49.1	4.8	1.6
Commercial . . . . .	5,791	32.1	13,338	11.7	11.7	7.4	1.3	10.4	9.1	46.8	1.6	1.8
Industrial . . . . .	18,796	27.4	31,559	5.9	10.4	9.9	1.2	9.5	9.4	50.9	2.9	1.0
Transportation . . . . .	3,974	34.2	24,134	10.7	12.3	10.3	0.9	11.4	9.6	42.1	2.7	1.9
Government. . . . .	2,141	33.5	7,312	7.2	10.2	15.1	1.0	9.4	10.4	43.0	3.5	2.7
Other . . . . .	3,679	26.9	8,242	6.7	10.8	7.7	1.7	8.2	8.2	53.8	2.9	1.9
Not specified. . . . .	4,252	5.8	1,447	1.9	1.1	1.3	1.5	2.4	0.6	12.8	78.4	1.1
Market price for most products:												
Less than \$5. . . . .	5,274	30.4	12,407	9.5	10.2	9.3	1.4	10.9	9.8	45.6	3.2	1.7
\$5 to \$100. . . . .	10,422	29.8	21,930	7.8	11.8	8.5	1.7	10.9	10.6	45.9	2.8	1.4
\$101 to \$1,000 . . . . .	8,846	28.1	15,696	7.4	10.8	9.2	0.7	10.3	10.9	48.2	2.4	1.5
\$1,001 to \$2,000. . . . .	2,023	26.3	3,809	8.3	10.2	6.3	1.5	8.7	6.2	56.8	2.0	2.5
\$2,001 to \$10,000. . . . .	4,265	27.3	6,326	6.4	10.0	9.5	1.4	10.0	7.9	51.7	3.2	1.9
Over \$10,000. . . . .	7,340	30.1	32,342	6.2	10.8	12.0	1.1	8.8	7.3	51.3	2.5	1.4
Not specified. . . . .	4,821	6.5	3,355	2.8	1.8	1.0	0.9	1.1	1.4	19.7	71.3	1.1
Products made to military specifications:												
Yes . . . . .	14,112	34.8	44,969	9.2	12.0	12.2	1.4	11.1	10.9	40.7	2.4	1.2
No. . . . .	22,214	26.2	46,955	6.7	10.4	7.9	1.2	9.3	8.4	52.8	3.3	0.8
Don't know . . . . .	2,939	22.6	3,852	6.9	7.4	5.9	2.4	9.9	7.9	56.6	3.0	2.1
Not specified. . . . .	3,726	0.4	89	0.2	-	0.1	0.1	0.2	0.5	10.2	88.6	0.2
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies who are prime defense contractors to Federal Defense Agencies:												
1 to 25 percent . . . . .	9,934	33.5	26,620	8.1	12.5	11.8	1.1	11.0	11.4	41.7	2.3	1.4
26 to 75 percent . . . . .	2,499	35.8	6,082	10.6	10.9	13.4	0.9	11.1	13.5	37.4	2.2	3.0
Over 75 percent . . . . .	1,148	34.8	2,512	10.2	7.5	15.5	1.6	8.2	8.8	46.3	2.1	4.4
None . . . . .	11,808	23.1	29,353	6.5	9.4	6.4	0.8	8.7	6.9	57.9	3.4	1.1
Don't know . . . . .	13,573	29.0	30,457	7.5	10.5	8.9	2.1	10.3	9.3	48.6	3.0	1.1
Not specified. . . . .	4,029	3.4	842	0.5	2.4	0.3	0.2	1.0	0.2	12.2	83.2	0.9

See footnotes at the end of the table.

Table 9I. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE: COMPUTERS USED FOR CONTROL ON THE FACTORY FLOOR—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations (percent)	Number of dedicated work stations	Percent distribution								Absolute standard error of "Used in operations" (percent) <sup>3</sup>
				When technology was first implemented				Plan to use within				
				Within past 2 years	Last 2 to 5 years	More than 5 years ago	Not specified <sup>2</sup>	2 years	2 to 5 years	No plans to use	Not specified	
Percent of the plant's total value of shipments that are exported for direct sale:												
None .....	13,687	22.3	16,705	6.9	8.1	6.1	1.2	8.7	7.4	58.3	3.4	1.2
Less than 10 percent .....	15,360	30.1	32,540	7.5	11.0	10.3	1.3	10.9	11.1	45.0	2.8	1.0
10 to 19 percent .....	4,737	36.8	13,721	9.6	14.5	11.3	1.4	9.9	8.7	42.9	1.7	1.8
20 to 49 percent .....	3,912	35.1	15,295	8.0	13.1	12.3	1.7	10.3	11.0	40.8	2.8	1.8
50 percent or more .....	1,398	37.5	16,956	6.6	15.3	13.5	2.1	11.4	4.1	44.8	2.1	3.0
Not specified .....	3,897	2.6	648	1.0	0.4	0.9	0.3	0.5	0.8	10.0	86.2	0.5
Where is most of the research and development work for the plant done:												
Outside the firm. ....	1,834	29.2	1,934	10.1	7.8	11.1	0.2	10.7	11.4	47.1	1.7	3.7
In the plant .....	25,416	29.5	56,625	7.7	10.7	9.6	1.5	10.5	10.2	46.8	3.1	0.8
Elsewhere in the firm. ....	4,969	42.8	32,871	9.5	17.4	13.6	2.3	10.6	7.8	36.7	2.1	1.7
No research and development done .....	7,046	17.4	4,269	5.4	7.0	4.6	0.4	7.6	6.6	65.3	3.1	1.7
Not specified .....	3,726	0.8	167	0.2	0.4	0.2	-	0.1	0.2	9.3	89.5	0.3
Where is most of the formal training for the plant conducted:												
In the plant .....	29,449	30.4	78,946	7.8	11.3	9.8	1.5	9.6	9.1	47.8	3.2	0.8
Elsewhere in the firm. ....	1,099	43.4	5,336	14.2	15.1	13.6	0.5	17.6	5.0	32.7	1.5	3.8
Outside the firm. ....	3,506	32.8	7,649	9.3	12.4	10.1	1.0	13.6	13.6	38.1	1.9	2.2
No formal training for staff ...	5,251	15.2	3,736	4.0	5.5	5.0	0.7	7.8	8.1	66.3	2.5	1.5
Not specified .....	3,686	1.4	198	0.3	0.5	0.3	0.3	0.2	0.6	7.5	90.2	0.4
Who conducts most of the formal training for the staff:												
Staff from inside the plant. ....	26,952	28.3	57,096	7.3	10.7	9.0	1.3	9.3	9.1	49.9	3.3	0.8
Staff from outside the plant. ....	1,637	44.4	17,997	12.8	13.9	15.1	2.6	14.6	6.2	34.0	0.7	3.0
Trainers from outside the firm .....	5,287	40.5	16,112	10.8	15.7	13.0	1.0	13.8	12.0	31.9	1.8	1.9
Not specified .....	9,115	9.9	4,659	2.7	3.2	3.2	0.8	4.9	5.0	42.0	38.0	0.9
Difficulty in hiring skilled personnel to work with the technologies used in the plant:												
Not difficult .....	13,905	22.3	18,740	5.7	7.6	8.0	1.0	8.9	7.6	58.4	2.8	1.0
Some problems .....	19,836	31.9	63,858	8.2	12.3	9.7	1.7	10.4	10.1	45.2	2.5	0.9
Very difficult. ....	5,401	35.7	12,911	10.2	13.2	11.2	1.1	11.4	10.6	37.7	4.6	2.2
Not specified .....	3,849	1.7	357	0.5	0.5	0.4	0.3	0.3	0.5	10.7	86.8	0.5
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:												
Yes .....	3,265	44.0	13,490	8.7	18.2	15.3	1.8	12.4	7.9	33.4	2.2	1.9
No .....	34,703	26.8	72,565	7.3	9.8	8.5	1.2	9.8	9.5	50.9	3.1	0.7
Don't know .....	1,447	44.3	9,725	11.8	14.6	14.2	3.7	9.0	7.3	37.9	1.3	3.0
Not specified .....	3,576	0.7	85	0.2	0.3	0.1	0.1	0.1	0.2	6.4	92.7	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.<sup>2</sup>"Not specified" includes data for nonrespondents.<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."



Table 9J. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: COMPUTERS USED FOR CONTROL ON THE FACTORY FLOOR**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
All establishments.....	42,991	26.5	10.0	8.5	2.6	3.2	2.3	0.6
Major Group:								
34, Fabricated Metal Products.....	13,190	20.2	7.4	6.5	2.0	2.3	2.1	1.1
35, Industrial Machinery and Equipment.....	14,231	28.1	10.1	9.6	2.9	3.4	2.2	1.2
36, Electronic and Other Electric Equipment.....	7,472	33.2	13.8	9.4	3.0	4.2	2.8	1.2
37, Transportation Equipment.....	4,110	26.8	10.0	8.1	2.4	4.2	2.2	1.2
38, Instruments and Related Products.....	3,988	29.0	11.3	10.0	2.7	2.1	3.1	1.3
Employment size:								
20 to 99.....	30,502	18.8	7.2	6.0	1.7	2.4	1.6	0.8
100 to 499.....	10,321	41.6	15.3	13.3	4.3	4.7	4.0	0.8
500 and over.....	2,168	62.8	24.0	20.8	6.6	6.8	4.8	0.8
Age of plant (years):								
Less than 5.....	4,893	27.5	11.7	8.0	1.3	3.6	2.9	1.9
5 to 15.....	13,722	28.2	10.8	9.6	2.5	3.2	2.1	1.2
16 to 30.....	11,303	29.4	11.4	8.7	3.6	3.4	2.3	1.3
Over 30.....	9,310	30.7	10.3	10.3	3.1	3.9	3.2	1.2
Not specified.....	3,763	0.5	0.1	-	-	-	0.4	0.2
Manufacturing process:								
Fabrication/machining.....	6,795	26.6	9.3	8.4	2.1	3.4	3.3	1.9
Assembly.....	6,388	28.5	12.3	8.3	2.5	3.0	2.4	1.3
Both.....	23,393	30.8	10.9	10.4	3.3	3.8	2.3	0.9
Neither.....	2,577	20.9	11.4	4.3	0.7	1.6	2.9	2.4
Not specified.....	3,838	1.3	0.6	-	0.1	-	0.6	0.5
Market for most products:								
Consumer.....	4,358	25.2	10.9	6.8	2.4	3.4	1.7	1.6
Commercial.....	5,791	32.1	14.2	9.2	3.7	2.6	2.6	1.8
Industrial.....	18,796	27.4	9.4	9.4	2.9	3.5	2.2	1.0
Transportation.....	3,974	34.2	12.4	11.3	2.3	5.5	2.6	1.9
Government.....	2,141	33.6	13.3	12.4	3.6	1.4	2.9	2.7
Other.....	3,679	26.9	10.4	7.7	1.8	4.2	2.8	1.9
Not specified.....	4,252	5.7	1.7	1.2	0.3	0.1	2.4	1.1
Market price for most products:								
Less than \$5.....	5,274	30.4	12.8	8.0	2.5	4.4	2.7	1.7
\$5 to \$100.....	10,422	29.8	11.2	8.3	3.5	3.7	3.2	1.4
\$101 to \$1,000.....	8,846	28.1	10.2	9.2	2.7	3.9	2.1	1.5
\$1,001 to \$2,000.....	2,023	26.3	8.1	8.5	2.3	5.4	2.1	2.5
\$2,001 to \$10,000.....	4,265	27.3	8.1	11.8	2.9	2.3	2.2	1.9
Over \$10,000.....	7,340	30.1	12.4	11.2	2.0	2.2	2.3	1.4
Not specified.....	4,821	6.4	2.6	1.2	1.0	0.7	0.9	1.1
Products made to military specifications:								
Yes.....	14,112	34.9	13.0	11.4	3.6	3.8	3.1	1.2
No.....	22,214	26.2	10.1	8.2	2.5	3.2	2.1	0.8
Don't know.....	2,939	22.6	7.0	7.7	1.1	3.7	3.1	2.1
Not specified.....	3,726	0.5	0.1	-	-	-	0.3	0.2
Percent, on an annual basis, of all products manufactured at the plant that are shipped to other companies that are prime contractors to Federal Defense Agencies:								
1 to 25 percent.....	9,934	33.6	12.4	11.7	2.8	3.7	3.0	1.4
26 to 75 percent.....	2,499	35.8	12.6	15.0	3.6	3.1	1.4	3.0
Over 75 percent.....	1,148	34.7	17.5	7.4	2.0	4.8	3.0	4.4
None.....	11,808	23.1	8.5	7.0	3.0	3.1	1.6	1.1
Don't know.....	13,573	28.9	11.2	8.6	2.5	3.7	3.0	1.1
Not specified.....	4,029	3.4	0.7	1.0	0.6	0.1	0.9	0.9

See footnotes at the end of the table.

Table 9J. **PERCENTAGE OF ESTABLISHMENTS USING AND THE SINGLE MOST SIGNIFICANT REASON FOR USING SELECTED TECHNOLOGIES: COMPUTERS USED FOR CONTROL ON THE FACTORY FLOOR**—Continued

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Single most significant reason for using the technology (percent distribution)					Absolute standard error of "Used in operations" (percent) <sup>3</sup>
			Improved quality	Increased output	Lower labor cost	Other	Not specified <sup>2</sup>	
Percent of the total value of shipments that are exported for direct sale:								
None .....	13,687	22.2	7.8	6.8	2.6	2.9	2.1	1.2
Less than 10 percent .....	15,360	30.1	11.6	9.7	2.9	3.4	2.5	1.0
10 to 19 percent .....	4,737	36.9	13.8	13.2	2.7	4.2	2.9	1.8
20 to 49 percent .....	3,912	35.1	13.8	10.9	3.4	4.2	2.8	1.8
50 percent or more .....	1,398	37.4	14.8	10.9	1.7	5.0	5.0	3.0
Not specified .....	3,897	2.5	1.1	0.5	0.2	0.3	0.4	0.5
Where is most of the research and development work for the plant done:								
Outside this plant .....	1,834	29.1	12.0	6.9	2.4	4.8	3.0	3.7
In this plant .....	25,416	29.5	11.3	9.7	2.8	3.3	2.5	0.8
Elsewhere in the firm .....	4,969	42.8	14.7	14.4	3.9	5.3	4.5	1.7
No research and development done ..	7,046	17.3	6.8	4.9	2.3	2.3	1.0	1.7
Not specified .....	3,726	0.8	0.3	0.1	-	-	0.4	0.3
Where is most of the formal training for the staff conducted:								
In this plant .....	29,449	30.3	11.6	9.5	2.9	3.6	2.8	0.8
Elsewhere in the firm .....	1,099	43.3	12.5	17.8	4.3	5.7	3.0	3.8
Outside the firm .....	3,506	32.8	11.2	10.8	4.2	4.5	2.1	2.2
No formal training for staff conducted .....	5,251	15.2	6.3	5.4	0.8	1.6	1.2	1.5
Not specified .....	3,686	1.5	0.3	0.3	-	0.2	0.6	0.4
Who conducts most of the formal training for the staff:								
Staff from inside the plant .....	26,952	28.3	10.9	8.9	2.8	3.3	2.4	0.8
Staff from outside the plant .....	1,637	44.4	13.9	15.9	4.2	6.5	3.8	3.0
Trainers from outside the firm .....	5,287	40.4	15.2	12.8	4.2	5.1	3.1	1.9
Not specified .....	9,115	10.0	3.6	3.4	0.5	1.1	1.4	0.9
Difficulty in hiring skilled personnel to work with the technologies used in the plant:								
Not difficult .....	13,905	22.3	7.6	7.8	2.3	3.1	1.5	1.0
Some problems .....	19,836	31.9	12.6	9.5	2.9	3.6	3.2	0.9
Very difficult .....	5,401	35.6	13.4	12.2	3.6	4.0	2.4	2.2
Not specified .....	3,849	1.7	0.5	0.3	0.3	-	0.6	0.5
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:								
Yes .....	3,265	44.0	17.5	14.6	3.9	4.0	4.0	1.9
No .....	34,703	26.8	10.1	8.6	2.6	3.3	2.3	0.7
Don't know .....	1,447	44.4	15.4	13.4	4.6	6.4	4.7	3.0
Not specified .....	3,576	0.6	0.2	0.1	-	-	0.3	0.2

Note: Data may not add to totals due to the independent rounding of individual figures.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not specified" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

Table 10A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: COMPUTER-AIDED DESIGN (CAD) OR COMPUTER-AIDED ENGINEERING (CAE) SYSTEMS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	6,097	41,118	3,770	3.3
26 to 75 percent .....	1,181	768	12,081	413	8.9
Over 75 percent .....	914	532	14,436	382	10.2
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	144	2,354	4,092	20.6
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	21.8	21,563	20.4	1.1
Department of the Navy .....	4,602	26.5	25,868	25.4	1.3
Department of the Air Force .....	3,297	15.6	19,778	15.7	0.8
Marine Corps .....	758	1.6	4,611	1.6	0.2
Defense Logistics Agency .....	2,853	18.1	12,936	17.3	1.1
Other .....	2,011	16.4	12,990	19.6	1.1
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	15.4	8,973	24.6	1.6
Department of the Navy .....	773	35.5	10,234	34.6	3.3
Department of the Air Force .....	567	19.4	9,102	11.7	2.0
Marine Corps .....	113	0.8	932	1.8	0.2
Defense Logistics Agency .....	526	19.2	3,762	21.0	3.3
Other .....	222	9.7	5,852	6.3	1.7
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	20.2	7,234	26.3	2.0
Department of the Navy .....	597	42.7	9,303	33.3	4.3
Department of the Air Force .....	440	24.5	11,716	11.6	3.0
Marine Corps .....	129	1.2	3,561	0.7	0.2
Defense Logistics Agency .....	321	5.2	1,962	15.9	1.4
Other .....	232	6.2	7,607	12.2	0.9
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."



Table 10B. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: COMPUTER-AIDED DESIGN (CAD) OUTPUT USED TO CONTROL MANUFACTURING MACHINES**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	2,709	10,237	7,158	5.7
26 to 75 percent .....	1,181	349	1,316	832	15.2
Over 75 percent .....	914	236	1,931	678	10.4
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	33	255	4,203	27.0
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	21.0	4,689	21.5	2.0
Department of the Navy .....	4,602	26.2	7,008	26.2	2.1
Department of the Air Force .....	3,297	17.5	4,353	14.8	1.7
Marine Corps .....	758	1.4	1,147	1.7	0.4
Defense Logistics Agency .....	2,853	15.6	2,566	19.1	1.5
Other .....	2,011	18.3	3,446	16.7	2.0
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	14.1	747	19.4	1.8
Department of the Navy .....	773	32.1	1,060	37.0	5.3
Department of the Air Force .....	567	21.6	976	15.5	3.5
Marine Corps .....	113	0.5	62	1.3	0.2
Defense Logistics Agency .....	526	24.5	551	17.0	6.7
Other .....	222	7.2	510	9.8	2.0
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	21.6	809	22.3	2.4
Department of the Navy .....	597	37.3	1,283	40.9	3.6
Department of the Air Force .....	440	31.0	1,544	15.9	4.2
Marine Corps .....	129	1.3	543	1.0	0.3
Defense Logistics Agency .....	321	3.0	188	11.0	0.6
Other .....	232	5.8	1,368	8.9	1.0
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 10C. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: DIGITAL REPRESENTATION OF COMPUTER-AIDED DESIGN OUTPUT USED IN PROCUREMENT ACTIVITIES**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	1,349	-	8,518	7.5
26 to 75 percent .....	1,181	163	-	1,018	19.6
Over 75 percent .....	914	155	-	759	18.3
None .....	-	-	-	-	-
Don't know. ....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	9	-	4,227	41.4
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	22.0	-	21.1	1.9
Department of the Navy .....	4,602	23.6	-	26.8	2.4
Department of the Air Force .....	3,297	18.9	-	15.1	2.2
Marine Corps .....	758	2.5	-	1.4	0.7
Defense Logistics Agency .....	2,853	14.2	-	18.7	1.8
Other .....	2,011	18.8	-	16.9	2.6
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	14.4	-	18.1	3.5
Department of the Navy .....	773	26.1	-	37.1	4.9
Department of the Air Force .....	567	15.3	-	18.1	3.4
Marine Corps .....	113	0.9	-	1.1	0.4
Defense Logistics Agency .....	526	32.1	-	17.1	11.6
Other .....	222	11.2	-	8.5	4.1
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	11.9	-	24.6	2.4
Department of the Navy .....	597	46.0	-	38.3	8.6
Department of the Air Force .....	440	31.0	-	17.7	5.2
Marine Corps .....	129	1.1	-	1.1	0.3
Defense Logistics Agency .....	321	4.3	-	9.6	1.0
Other .....	232	5.7	-	8.7	1.4
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 11A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: FLEXIBLE MANUFACTURING CELLS (FMC) OR SYSTEMS (FMS)**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	1,302	-	8,565	6.9
26 to 75 percent .....	1,181	140	-	1,041	14.5
Over 75 percent .....	914	91	-	823	10.6
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	12	-	4,224	30.1
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	23.6	-	20.9	2.3
Department of the Navy .....	4,602	21.5	-	27.1	1.8
Department of the Air Force .....	3,297	13.6	-	16.0	1.5
Marine Corps .....	758	1.9	-	1.6	0.3
Defense Logistics Agency .....	2,853	19.0	-	17.7	2.0
Other .....	2,011	20.4	-	16.7	2.7
Not specified .....	-	-	-	-	-
Percent (26 to 75) percent, of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	20.0	-	17.1	3.1
Department of the Navy .....	773	36.0	-	35.1	6.3
Department of the Air Force .....	567	19.6	-	17.3	3.1
Marine Corps .....	113	0.8	-	1.1	0.3
Defense Logistics Agency .....	526	11.6	-	20.9	1.8
Other .....	222	12.0	-	8.5	3.7
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	25.8	-	21.6	3.2
Department of the Navy .....	597	30.0	-	41.1	2.9
Department of the Air Force .....	440	32.2	-	19.0	3.8
Marine Corps .....	129	1.4	-	1.0	0.2
Defense Logistics Agency .....	321	1.3	-	9.5	0.4
Other .....	232	9.3	-	7.8	1.7
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."



Table 11B. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: NUMERICALLY CONTROLLED (NC)/COMPUTER NUMERICALLY CONTROLLED (CNC) MACHINES**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent . . . . .	9,867	4,774	41,369	5,093	4.1
26 to 75 percent . . . . .	1,181	559	7,551	622	11.5
Over 75 percent . . . . .	914	526	4,908	388	12.3
None . . . . .	-	-	-	-	-
Don't know . . . . .	-	-	-	-	-
Not specified <sup>4</sup> . . . . .	4,236	39	451	4,197	26.2
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army . . . . .	4,058	20.8	19,092	22.0	1.4
Department of the Navy . . . . .	4,602	25.6	25,848	27.1	1.5
Department of the Air Force . . . . .	3,297	17.3	19,727	13.4	1.2
Marine Corps . . . . .	758	1.4	4,233	1.9	0.2
Defense Logistics Agency . . . . .	2,853	19.3	17,536	16.1	1.3
Other . . . . .	2,011	15.6	10,578	19.5	1.3
Not specified . . . . .	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army . . . . .	610	15.7	4,442	19.9	2.0
Department of the Navy . . . . .	773	36.0	5,146	34.3	4.8
Department of the Air Force . . . . .	567	19.8	4,180	14.8	2.6
Marine Corps . . . . .	113	0.8	324	1.3	0.3
Defense Logistics Agency . . . . .	526	21.7	3,535	17.1	4.6
Other . . . . .	222	6.0	2,358	12.6	1.4
Not specified . . . . .	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army . . . . .	496	19.4	2,957	27.9	2.3
Department of the Navy . . . . .	597	39.9	3,079	39.6	5.6
Department of the Air Force . . . . .	440	21.4	2,794	18.5	3.3
Marine Corps . . . . .	129	1.0	860	1.3	0.2
Defense Logistics Agency . . . . .	321	9.2	1,040	7.1	2.9
Other . . . . .	232	9.1	2,032	5.4	2.9
Not specified . . . . .	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 11C. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: MATERIALS WORKING LASERS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	617	1,288	9,250	10.9
26 to 75 percent .....	1,181	63	121	1,118	17.4
Over 75 percent .....	914	65	231	849	12.4
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	-	-	4,236	57.5
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	18.1	545	21.6	2.4
Department of the Navy .....	4,602	26.7	833	26.2	4.0
Department of the Air Force .....	3,297	20.9	677	15.2	2.9
Marine Corps .....	758	0.9	126	1.7	0.2
Defense Logistics Agency .....	2,853	12.9	485	18.3	2.0
Other .....	2,011	20.5	273	17.0	3.8
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	22.9	93	17.1	3.7
Department of the Navy .....	773	35.5	112	35.3	4.2
Department of the Air Force .....	567	21.2	98	17.4	3.0
Marine Corps .....	113	0.3	7	1.1	0.2
Defense Logistics Agency .....	526	9.4	59	20.3	2.8
Other .....	222	10.6	29	8.8	5.4
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	24.3	200	21.9	3.2
Department of the Navy .....	597	36.4	188	40.1	3.1
Department of the Air Force .....	440	27.5	191	19.9	2.8
Marine Corps .....	129	1.6	119	1.0	0.4
Defense Logistics Agency .....	321	2.0	119	9.1	0.5
Other .....	232	8.2	169	8.0	1.4
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 11D. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: PICK AND PLACE ROBOTS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	738	4,537	9,129	7.6
26 to 75 percent .....	1,181	77	284	1,104	13.9
Over 75 percent .....	914	89	275	825	9.2
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	8	28	4,228	38.0
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	20.7	2,544	21.4	3.8
Department of the Navy .....	4,602	22.4	2,160	26.6	2.4
Department of the Air Force .....	3,297	10.2	1,682	16.1	1.1
Marine Corps .....	758	1.1	943	1.6	0.2
Defense Logistics Agency .....	2,853	22.1	1,641	17.5	2.3
Other .....	2,011	23.5	1,550	16.8	3.2
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	21.7	210	17.2	2.5
Department of the Navy .....	773	27.5	215	35.9	3.1
Department of the Air Force .....	567	24.2	182	17.1	3.1
Marine Corps .....	113	0.6	66	1.1	0.2
Defense Logistics Agency .....	526	12.1	171	20.2	2.5
Other .....	222	13.9	156	8.5	5.5
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	27.6	222	21.4	2.4
Department of the Navy .....	597	33.6	218	40.6	3.0
Department of the Air Force .....	440	28.0	179	19.6	2.7
Marine Corps .....	129	0.7	32	1.1	0.2
Defense Logistics Agency .....	321	3.3	63	9.2	1.0
Other .....	232	6.8	116	8.1	1.6
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."



Table 11E. PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: OTHER ROBOTS

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	412	3,044	9,455	10.3
26 to 75 percent .....	1,181	37	98	1,144	18.7
Over 75 percent .....	914	69	219	845	10.7
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	8	26	4,228	38.7
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	30.9	2,493	20.8	4.6
Department of the Navy .....	4,602	25.1	2,462	26.3	3.3
Department of the Air Force .....	3,297	13.5	1,916	15.7	1.8
Marine Corps .....	758	1.8	2,056	1.6	0.3
Defense Logistics Agency .....	2,853	11.8	996	18.2	2.3
Other .....	2,011	16.9	1,021	17.4	2.7
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	24.7	47	17.2	5.7
Department of the Navy .....	773	34.2	77	35.3	4.4
Department of the Air Force .....	567	23.1	60	17.4	5.6
Marine Corps .....	113	1.7	8	1.0	0.9
Defense Logistics Agency .....	526	14.3	68	19.8	4.7
Other .....	222	2.0	14	9.3	0.8
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	36.7	151	20.6	4.1
Department of the Navy .....	597	31.3	107	40.6	3.5
Department of the Air Force .....	440	23.0	145	20.3	2.6
Marine Corps .....	129	1.1	85	1.1	0.2
Defense Logistics Agency .....	321	0.9	22	9.4	0.4
Other .....	232	7.0	100	8.0	1.4
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 12A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (AS/RS)**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	317	-	9,542	10.2
26 to 75 percent .....	1,181	55	-	1,126	15.8
Over 75 percent .....	914	69	-	846	9.0
None .....	-	-	-	-	-
Don't know. ....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	2	-	4,234	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	20.7	-	21.4	2.5
Department of the Navy .....	4,602	20.1	-	26.5	2.3
Department of the Air Force .....	3,297	22.5	-	15.3	3.4
Marine Corps .....	758	1.6	-	1.6	0.3
Defense Logistics Agency .....	2,853	17.7	-	17.9	3.3
Other .....	2,011	17.4	-	17.3	2.5
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	16.4	-	17.6	2.8
Department of the Navy .....	773	45.2	-	34.7	3.9
Department of the Air Force .....	567	16.1	-	17.7	3.3
Marine Corps .....	113	0.5	-	1.1	0.2
Defense Logistics Agency .....	526	12.6	-	20.0	3.8
Other .....	222	9.2	-	8.9	2.9
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	22.8	-	22.0	2.7
Department of the Navy .....	597	32.2	-	40.5	3.1
Department of the Air Force .....	440	29.1	-	19.7	2.9
Marine Corps .....	129	2.2	-	1.0	0.6
Defense Logistics Agency .....	321	3.1	-	9.1	1.2
Other .....	232	10.6	-	7.7	2.2
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 12B. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: AUTOMATIC GUIDED VEHICLE SYSTEMS (AGVS)**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense agencies (number):					
1 to 25 percent .....	9,867	91	-	9,776	9.5
26 to 75 percent .....	1,181	12	-	1,169	25.6
Over 75 percent .....	914	16	-	898	21.1
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	-	-	4,236	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense agencies shipped to the following agency:					
Department of the Army .....	4,058	33.4	-	21.2	3.2
Department of the Navy .....	4,602	21.6	-	26.3	2.8
Department of the Air Force .....	3,297	10.4	-	15.7	1.7
Marine Corps .....	758	3.0	-	1.6	0.6
Defense Logistics Agency .....	2,853	8.8	-	18.0	1.5
Other .....	2,011	22.8	-	17.2	3.8
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense agencies shipped to the following agency:					
Department of the Army .....	610	24.0	-	17.4	6.3
Department of the Navy .....	773	18.3	-	35.5	6.1
Department of the Air Force .....	567	36.0	-	17.4	9.6
Marine Corps .....	113	-	-	1.1	0.1
Defense Logistics Agency .....	526	20.2	-	19.6	12.9
Other .....	222	1.5	-	9.0	0.5
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense agencies shipped to the following agency:					
Department of the Army .....	496	32.9	-	21.8	5.9
Department of the Navy .....	597	16.1	-	40.3	4.9
Department of the Air Force .....	440	35.3	-	20.2	6.1
Marine Corps .....	129	0.8	-	1.1	0.3
Defense Logistics Agency .....	321	0.2	-	8.7	0.1
Other .....	232	14.7	-	7.9	4.4
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."



Table 13A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: AUTOMATIC SENSOR-BASED INSPECTION OR TESTING PERFORMED ON INCOMING OR IN-PROCESS MATERIALS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	1,044	-	8,823	7.4
26 to 75 percent .....	1,181	151	-	1,030	10.9
Over 75 percent .....	914	136	-	778	10.0
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	16	-	4,220	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	17.1	-	22.0	1.6
Department of the Navy .....	4,602	28.6	-	25.9	3.2
Department of the Air Force .....	3,297	16.1	-	15.6	1.8
Marine Corps .....	758	1.2	-	1.7	0.3
Defense Logistics Agency .....	2,853	15.9	-	18.2	1.6
Other .....	2,011	21.1	-	16.6	3.1
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	24.9	-	16.2	2.8
Department of the Navy .....	773	32.5	-	35.8	3.6
Department of the Air Force .....	567	22.0	-	16.9	3.0
Marine Corps .....	113	0.6	-	1.1	0.2
Defense Logistics Agency .....	526	15.8	-	20.3	3.1
Other .....	222	4.2	-	9.7	0.9
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	28.8	-	20.6	3.5
Department of the Navy .....	597	31.8	-	41.5	3.5
Department of the Air Force .....	440	26.7	-	19.2	2.7
Marine Corps .....	129	2.0	-	0.9	0.5
Defense Logistics Agency .....	321	2.2	-	9.9	0.7
Other .....	232	8.5	-	7.9	1.3
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 13B. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: AUTOMATIC SENSOR-BASED INSPECTION OR TESTING PERFORMED ON FINAL PRODUCT**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense agencies (number):					
1 to 25 percent .....	9,867	1,096	-	8,771	6.7
26 to 75 percent .....	1,181	181	-	1,000	11.0
Over 75 percent .....	914	155	-	759	9.6
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	22	-	4,214	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense agencies shipped to the following agency:					
Department of the Army .....	4,058	20.0	-	21.5	2.0
Department of the Navy .....	4,602	27.2	-	26.1	2.7
Department of the Air Force .....	3,297	17.8	-	15.4	1.8
Marine Corps .....	758	1.4	-	1.6	0.3
Defense Logistics Agency .....	2,853	16.1	-	18.1	1.5
Other .....	2,011	17.5	-	17.3	2.5
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense agencies shipped to the following agency:					
Department of the Army .....	610	20.4	-	16.9	2.1
Department of the Navy .....	773	26.5	-	37.2	2.7
Department of the Air Force .....	567	22.5	-	16.6	2.9
Marine Corps .....	113	0.8	-	1.1	0.3
Defense Logistics Agency .....	526	20.0	-	19.1	3.8
Other .....	222	7.8	-	9.1	2.0
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense agencies shipped to the following agency:					
Department of the Army .....	496	23.7	-	21.7	3.0
Department of the Navy .....	597	37.2	-	40.5	3.3
Department of the Air Force .....	440	26.8	-	18.9	2.7
Marine Corps .....	129	1.5	-	0.9	0.3
Defense Logistics Agency .....	321	3.0	-	10.0	0.6
Other .....	232	7.8	-	8.0	1.1
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 14A. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: LOCAL AREA NETWORKS FOR TECHNICAL DATA**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	3,264	-	6,603	4.2
26 to 75 percent .....	1,181	325	-	856	9.4
Over 75 percent .....	914	328	-	586	11.2
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	33	-	4,203	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	21.1	-	21.5	1.4
Department of the Navy .....	4,602	24.9	-	27.1	1.4
Department of the Air Force .....	3,297	16.8	-	15.0	1.2
Marine Corps .....	758	1.7	-	1.6	0.2
Defense Logistics Agency .....	2,853	16.6	-	18.7	1.2
Other .....	2,011	18.9	-	16.2	1.6
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	19.9	-	16.5	2.9
Department of the Navy .....	773	35.3	-	35.1	3.3
Department of the Air Force .....	567	20.1	-	16.5	1.9
Marine Corps .....	113	1.0	-	1.1	0.3
Defense Logistics Agency .....	526	13.1	-	22.6	2.5
Other .....	222	10.6	-	8.2	2.2
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	19.1	-	24.2	2.2
Department of the Navy .....	597	36.3	-	42.4	4.0
Department of the Air Force .....	440	21.0	-	20.2	2.6
Marine Corps .....	129	1.7	-	0.6	0.4
Defense Logistics Agency .....	321	8.1	-	8.9	3.2
Other .....	232	13.8	-	3.7	3.9
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."



Table 14B. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: LOCAL AREA NETWORKS FOR FACTORY USE**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	2,457	-	7,410	4.9
26 to 75 percent .....	1,181	287	-	894	12.2
Over 75 percent .....	914	223	-	691	9.6
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	18	-	4,218	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	20.8	-	21.6	1.5
Department of the Navy .....	4,602	22.5	-	27.9	1.4
Department of the Air Force .....	3,297	18.0	-	14.6	1.5
Marine Corps .....	758	1.8	-	1.6	0.3
Defense Logistics Agency .....	2,853	15.3	-	19.0	1.2
Other .....	2,011	21.7	-	15.3	2.1
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	16.4	-	18.2	3.2
Department of the Navy .....	773	29.8	-	37.7	3.7
Department of the Air Force .....	567	18.2	-	17.7	2.5
Marine Corps .....	113	0.6	-	1.3	0.2
Defense Logistics Agency .....	526	23.4	-	17.3	7.2
Other .....	222	11.6	-	7.9	2.7
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	23.0	-	21.7	2.4
Department of the Navy .....	597	37.8	-	40.6	3.3
Department of the Air Force .....	440	22.5	-	19.7	2.1
Marine Corps .....	129	2.4	-	0.5	0.5
Defense Logistics Agency .....	321	6.5	-	9.5	2.9
Other .....	232	7.8	-	8.0	1.2
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 14C. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: INTERCOMPANY COMPUTER NETWORKS LINKING PLANTS TO SUBCONTRACTORS, SUPPLIERS, OR CUSTOMERS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	1,576	-	8,291	5.5
26 to 75 percent .....	1,181	146	-	1,035	19.8
Over 75 percent .....	914	121	-	793	11.7
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	39	-	4,197	(NA)
Percent, 1 to 25 percent, of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	21.1	-	21.4	1.8
Department of the Navy .....	4,602	23.1	-	27.0	2.0
Department of the Air Force .....	3,297	13.7	-	16.1	1.2
Marine Corps .....	758	1.8	-	1.6	0.4
Defense Logistics Agency .....	2,853	20.6	-	17.2	1.9
Other .....	2,011	19.7	-	16.7	1.9
Not specified .....	-	-	-	-	-
Percent, 26 to 75 percent, of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	21.1	-	17.0	4.7
Department of the Navy .....	773	43.1	-	34.1	10.6
Department of the Air Force .....	567	24.0	-	16.6	5.2
Marine Corps .....	113	0.9	-	1.1	0.3
Defense Logistics Agency .....	526	8.1	-	21.1	2.3
Other .....	222	2.8	-	10.1	0.8
Not specified .....	-	-	-	-	-
Percent, over 75 percent, of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	15.3	-	23.2	2.0
Department of the Navy .....	597	43.6	-	39.7	4.1
Department of the Air Force .....	440	24.5	-	19.5	3.1
Marine Corps .....	129	1.9	-	0.8	0.6
Defense Logistics Agency .....	321	1.6	-	9.8	0.4
Other .....	232	13.0	-	7.0	2.1
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

Table 14D. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: PROGRAMMABLE CONTROLLERS**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	2,566	44,562	7,301	4.7
26 to 75 percent .....	1,181	322	4,046	859	13.4
Over 75 percent .....	914	226	3,373	688	8.2
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	26	691	4,210	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	18.6	28,682	22.6	1.3
Department of the Navy .....	4,602	21.7	27,216	28.3	1.3
Department of the Air Force .....	3,297	14.4	15,009	16.1	1.1
Marine Corps .....	758	1.6	6,158	1.6	0.2
Defense Logistics Agency .....	2,853	21.6	14,735	16.3	1.7
Other .....	2,011	22.1	13,412	15.1	2.0
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	24.3	2,405	14.4	3.7
Department of the Navy .....	773	35.0	2,502	35.6	5.3
Department of the Air Force .....	567	18.8	2,035	17.2	3.0
Marine Corps .....	113	0.6	175	1.3	0.2
Defense Logistics Agency .....	526	14.0	2,245	21.8	3.5
Other .....	222	7.3	894	9.7	2.6
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	27.4	2,350	19.6	2.4
Department of the Navy .....	597	34.9	2,376	42.6	2.7
Department of the Air Force .....	440	25.1	1,889	18.4	2.9
Marine Corps .....	129	1.0	516	1.1	0.2
Defense Logistics Agency .....	321	4.2	640	10.2	0.8
Other .....	232	7.4	1,521	8.1	1.4
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."



Table 14E. **PERCENTAGE OF ESTABLISHMENTS USING, PLANNING, OR NOT PLANNING TO USE SELECTED TECHNOLOGIES WHO SHIP DIRECTLY TO FEDERAL DEFENSE AGENCIES: COMPUTERS USED FOR CONTROL ON THE FACTORY FLOOR**

Establishment characteristic	Number of establishments <sup>1</sup>	Used in operations	Number of dedicated work stations	Not currently used in operations <sup>2</sup>	Absolute standard error of "Used in operations" (percent) <sup>3</sup>
Establishments who manufacture products that are shipped directly to Federal Defense Agencies (number):					
1 to 25 percent .....	9,867	2,781	21,462	7,086	4.6
26 to 75 percent .....	1,181	379	3,846	802	11.9
Over 75 percent .....	914	269	3,104	645	11.8
None .....	-	-	-	-	-
Don't know .....	-	-	-	-	-
Not specified <sup>4</sup> .....	4,236	12	374	4,224	(NA)
Percent (1 to 25 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	4,058	20.5	11,352	21.8	1.4
Department of the Navy .....	4,602	21.7	12,879	28.5	1.3
Department of the Air Force .....	3,297	17.8	10,427	14.5	1.4
Marine Corps .....	758	1.4	2,421	1.7	0.2
Defense Logistics Agency .....	2,853	19.0	7,852	17.4	1.6
Other .....	2,011	19.6	6,748	16.1	1.6
Not specified .....	-	-	-	-	-
Percent (26 to 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	610	16.4	2,626	18.2	2.1
Department of the Navy .....	773	35.6	3,323	35.0	4.4
Department of the Air Force .....	567	19.8	1,894	16.3	3.0
Marine Corps .....	113	0.6	423	1.3	0.2
Defense Logistics Agency .....	526	17.8	1,321	20.7	3.8
Other .....	222	9.8	991	8.5	2.8
Not specified .....	-	-	-	-	-
Percent (over 75 percent) of shipments to Federal Defense Agencies shipped to the following agency:					
Department of the Army .....	496	24.1	2,205	20.7	2.9
Department of the Navy .....	597	44.9	2,554	37.8	5.2
Department of the Air Force .....	440	20.2	2,397	20.5	2.6
Marine Corps .....	129	1.0	1,176	1.1	0.2
Defense Logistics Agency .....	321	3.9	828	10.9	0.8
Other .....	232	5.9	1,511	9.0	0.9
Not specified .....	-	-	-	-	-

Note: Data may not add to totals due to the independent rounding of individual figures.

Percents are derived by dividing the total percent reported in each military agency by the number of establishments reporting "Used in operations" who ship directly to Federal Defense Agencies.

- Represents zero. (NA) Not available.

<sup>1</sup>For each characteristic, excluding all establishments, major groups, and employment size, the numbers shown in this column are sample estimates. Relative standard errors for these sample estimates can be found in appendix D.

<sup>2</sup>"Not currently used in operations" includes data for nonrespondents.

<sup>3</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."

<sup>4</sup>"Not specified" includes data for "None" and "Don't know."

## Appendix A. Explanation of Terms

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**Manufacturing Technologies.** The definitions and terms for the manufacturing technologies listed below were developed after consultation with several trade associations, primarily the Robotic Industries Association and the Automation Forum. The major government agencies consulted were the International Trade Administration and the National Institute of Standards and Technology.

**Computer-Aided Design (CAD) and/or Computer-Aided Engineering.** Use of computers for drawing and designing parts or products and for analysis and testing of designed parts or products.

**Computer-Aided Design (CAD)/Computer-Aided Manufacturing (CAM).** Use of CAD output for controlling machines used to manufacture the part or product.

**Digital Data Representation.** Use of digital representation of CAD output for controlling machines used to manufacture the part or product.

**NC/CNC Machine.** A single machine either numerically controlled (NC) or computer numerically controlled (CNC) with or without automated material handling capabilities. NC machines are controlled by numerical commands, punched on paper or plastic mylar tape while CNC machines are controlled electronically through a computer residing in the machine.

**Flexible Manufacturing Cell (FMC).** Two or more machines with automated material handling capabilities controlled by computers or programmable controllers, capable of single path acceptance of raw material and single path delivery of finished product.

**Flexible Manufacturing System (FMS).** Two or more machines with automated material handling capabilities controlled by computers or programmable controllers, capable of multiple path acceptance of raw material and multiple path delivery of finished product. A FMS may also be comprised of two or more FMC's linked in series or parallel.

**Materials Working Laser.** Laser technology used for welding, cutting, treating, scribing, and marking.

**Robot.** A reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.

**Pick and Place Robot.** A simple robot, with one, two, or three degrees of freedom, which transfers items from place to place by means of point-to-point moves. Little or no trajectory control is available.

**Automatic Storage and Retrieval System (AS/RS).** Computer controlled equipment providing for the automatic handling and storage of materials, parts, subassemblies, or finished products.

**Automatic Guided Vehicle System (AGVS).** Vehicles equipped with automatic guidance devices programmed to follow a path that interfaces with work stations for automated or manual loading and unloading of materials, tools, parts, or products.

**Technical Data Network.** Use of local area network (LAN) technology to exchange technical data within design and engineering departments.

**Factory Network.** Use of local area network (LAN) technology to exchange information between different points on the factory floor.

**Programmable Controller.** A solid state industrial control device that has programmable memory for storage of instructions, which performs functions equivalent to a relay panel or wired solid state logic control system.

**Computers Used for Control on the Factory Floor.** Exclude computers imbedded within machines, or computers used solely for data acquisitions or monitoring. Include computers that may be dedicated to control, but which are capable of being reprogrammed for other functions.






# Appendix B. Report Form

**DUE DATE: 30 DAYS AFTER RECEIPT**

OMB No. 0607-0766: Approval Expires 02/28/94

<p>FORM <b>SMT-1</b> (3-23-93)</p> <p>U.S. DEPARTMENT OF COMMERCE BUREAU OF THE CENSUS</p> <p><b>SURVEY OF TECHNOLOGY</b></p> <p><b>PREVALENCE AND PLANS FOR USE</b></p>	<p><b>NOTICE</b> – Response to this inquiry is required by law (Title 13, U.S. Code). By the same law, your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.</p> <p><b>In correspondence pertaining to this report, please refer to Census File Number (CFN)</b></p>
<p><b>RETURN TO</b></p> <p><b>Bureau of the Census Attn: CIR 1201 East Tenth Street Jeffersonville, IN 47133-0001</b></p>	<p>(Please correct any errors in name, address, and ZIP Code.)</p>
<p><b>TO PLANT MANAGER OR ENGINEER</b></p> <p>The health of the U.S. economy depends, to a large degree, on the productivity and competitiveness of American industry. To remain strong in the face of world competitive pressures, American industry must remain a leader in the development and use of advanced manufacturing technologies. Policymakers in Government and industry have expressed an increased need for information to assess patterns of use and diffusion of advanced manufacturing technologies across major manufacturing industries. In the absence of comprehensive and consistent information on this topic, the Bureau of the Census is conducting the following Survey of Technology: Prevalence and Plans for Use.</p> <p>We selected the establishment shown in the address box as part of a larger sample. It is important that we receive a response from each of the selected establishments, including yours, and that the department or authority most familiar with this plant's operations respond frankly to this survey.</p> <p>The law (Title 13, United States Code) requires your response to this survey. By Section 9 of the same law, your report to the Census Bureau is confidential. Only sworn Census Bureau employees will see the information you report and will use it only for statistical purposes. Please return the completed report within 30 days. If you have any questions concerning this survey, please call Mr. Steve Pope on (301) 763-1728.</p> <p>Thank you for your cooperation in this important survey. We appreciate your help.</p> <p>Sincerely,</p>  <p>Harry A. Scarr Acting Director Bureau of the Census</p>	
<p><b>INSTRUCTIONS</b></p> <p><b>Section A</b> – For each of the technologies listed, either mark an "X" in column 01 to indicate it is currently used in operations and indicate the number of dedicated workstations in column 02, OR mark an "X" in column 10, 11, or 12 to indicate when you plan to use the technology. If a technology is currently used in operations (that is, for each box marked in column 01), mark an "X" in column 03, 04, or 05 to indicate when the plant first began using the technology and mark an "X" in column 06, 07, 08, or 09 to indicate the most significant reason for the plant using the technology.</p> <p><b>Section B</b> – Mark an "X" in one box for each question concerning characteristics of your establishment.</p> <p><b>Section C</b> – Please verify that your form is complete. Use the "REMARKS" section if you would like to further explain any of your responses.</p> <p><b>Section D</b> – Provide contact information, sign, and return the form in the enclosed preaddressed envelope. Thank you for your cooperation with this important survey.</p> <p><b>Reasonable estimates are acceptable.</b></p>	
<p><b>BURDEN HOUR ESTIMATE</b></p> <p>We estimate the public reporting burden for this collection of information to be 15 minutes per questionnaire, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection including suggestions for reducing this burden, to the Associate Director for Administration, Paperwork Project 0607-0766, Room 3104, FB-3, Bureau of the Census, Washington, DC 20233-0001; and to the Office of Management and Budget, Paperwork Reduction Project 0607-0766, Washington, DC 20503.</p>	

SECTION A - TECHNOLOGY USAGE									
<b>INSTRUCTIONS</b> <b>Section A</b> - For each of the technologies listed, either mark an "X" in column 01 to indicate it is currently used in operations and indicate the number of dedicated workstations in column 02, OR mark an "X" in column 10, 11, or 12 to indicate when you plan to use the technology. If a technology is currently used in operations (that is, for each box marked in column 01), mark an "X" in column 03, 04, or 05 to indicate when the plant first began using the technology and mark an "X" in column 06, 07, 08, or 09 to indicate the most significant reason for the plant using the technology.	<b>CURRENTLY USED IN OPERATIONS</b>		<b>When did this plant first begin using this technology?</b>			<b>What is the single most significant reason for the plant using this technology?</b>			
	Used in operations (01)	Number of dedicated workstations (or items of equipment) (02)	Within the past 2 years (03)	In the last 2 to 5 years (04)	More than 5 years ago (05)	Mark (X) one box.			
						Improved quality (06)	Increase output (07)	Lower labor cost (08)	Other (09)
Technology									
<b>1. DESIGN AND ENGINEERING</b>									
a. Computer aided design (CAD) and/or computer aided engineering (CAE) 11									
b. CAD output used to control manufacturing machines (CAD/CAM) 12									
c. Digital representation of CAD output used in procurement activities 13									
<b>2. FABRICATION/MACHINING AND ASSEMBLY</b>									
a. Flexible manufacturing cell(s) (FMC) or system(s) (FMS) 21									
b. Numerically controlled (NC)/computer numerically controlled (CNC) machine(s) 22									
c. Materials working laser(s) 23									
d. Pick and place robot(s) 24									
e. Other robots 25									
<b>3. AUTOMATED MATERIAL HANDLING</b>									
a. Automatic storage and retrieval system (AS/RS) 31									
b. Automatic guided vehicle systems (AGVS) 32									
<b>4. AUTOMATED SENSOR BASED INSPECTION AND/OR TESTING EQUIPMENT</b>									
a. Performed on incoming or in-process materials 41									
b. Performed on final product 42									
<b>5. COMMUNICATIONS AND CONTROL</b>									
a. Local area network for technical data 51									
b. Local area network for factory use 52									
c. Intercompany computer network linking plant to subcontractors, suppliers, and/or customers 53									
d. Programmable controller(s) 54									
e. Computer(s) used for control on the factory floor 55									

**NOT CURRENTLY  
USED IN  
OPERATIONS**

[illegible]

### Survey of Technology: Prevalence and Plans for Use

- a. Computer Aided Design (CAD) and/or Computer Aided Engineering (CAE) –** Use of computers for drawing and designing parts or products and for analysis and testing of designed parts or products.
- b. Computer Aided Design (CAD)/Computer Aided Manufacturing (CAM) –** Use of CAD output for controlling machines used to manufacture the part or product.
- c. Digital Data Representation –** Use of digital representation of CAD output for controlling machines used in procurement activities.

**a. Flexible Manufacturing Cells (FMC)** – Two or more machines with automated material handling capabilities controlled by computers or programmable controllers, capable of single path acceptance of raw material and single path delivery of finished product.

**b. NC/CNC Machines** – A single machine either numerically controlled (NC) or computer numerically controlled (CNC) with or without automated material handling capabilities. NC machines are controlled by numerical commands punched on paper or plastic mylar tape. CNC machines are controlled electronically through a computer residing in the machine.

**d. Pick and Place Robot(s)** – A simple robot, with one, two, or three degrees of freedom, which transfers items from place to place by means of point-to-point moves. Little or no trajectory control is available.

**e. Robot(s)** – A reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized device through variable programmed motions for the performances of a variety of tasks.

**a. Automatic Storage and Retrieval System (AS/RS)** – Computer controlled equipment providing for the automatic handling and storage of materials, parts, subassemblies, or finished products.

**b. Automatic Guided Vehicle Systems (AGVS)** – Vehicles equipped with automatic guidance devices programmed to follow a path that interfaces with work stations for automated or manual loading and unloading of materials, tools, parts, or products.

**Automated Sensor Based Inspection and/or Testing Equipment** – Includes automated sensor based inspection and/or testing performed on incoming or in-process materials, or performed on the final product.

**a. Technical Data Network** – Use of local area network (LAN) technology to exchange technical data within design and engineering departments.

**b. Factory Network** – Use of local area network (LAN) technology to exchange information between different points on the factory floor.

**c. Intercompany Computer Network** – Use of network technology to link subcontractors, suppliers, and/or customers with the plant.

**d. Programmable Controller(s)** – A solid state industrial control device that has programmable memory for storage of instructions, which performs functions equivalent to a relay panel or wired solid state logic control system.

**e. Computer(s) Used for Control on the Factory Floor** – Exclude computers imbedded within machines, or computers used solely for data acquisitions or monitoring. Include computers that may be dedicated to control but are capable of being programmed for other functions.



SECTION B - CHARACTERISTICS OF THE ESTABLISHMENT	
1. How many years has this establishment manufactured products at this location?	<b>911</b> 1 <input type="checkbox"/> Less than 5 years      3 <input type="checkbox"/> 16 to 30 years 2 <input type="checkbox"/> 5 to 15 years      4 <input type="checkbox"/> Over 30 years
2. How would you characterize the nature of manufacturing at this plant?	<b>912</b> 1 <input type="checkbox"/> Fabrication/machining      3 <input type="checkbox"/> Fabrication/machining and assembly 2 <input type="checkbox"/> Assembly      4 <input type="checkbox"/> Neither fabrication/machining nor assembly
3. What is the average market price for MOST products of this plant?	<b>913</b> 1 <input type="checkbox"/> Less than \$5      4 <input type="checkbox"/> \$1,001 to \$2,000 2 <input type="checkbox"/> \$5 to \$100      5 <input type="checkbox"/> \$2,001 to \$10,000 3 <input type="checkbox"/> \$101 to \$1,000      6 <input type="checkbox"/> Over \$10,000
4. What is the market for MOST of the products of this plant?	<b>914</b> 1 <input type="checkbox"/> Consumer (personal use by household)      4 <input type="checkbox"/> Transportation 2 <input type="checkbox"/> Commercial (e.g., offices, hospitals, services, etc.)      5 <input type="checkbox"/> Government 3 <input type="checkbox"/> Industrial (manufacturing, mining, construction, and utilities)      6 <input type="checkbox"/> Other - Specify <u>  Z  </u>
5. Are any of the products produced in this plant manufactured to military specifications?	<b>915</b> 1 <input type="checkbox"/> Yes 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know
6. On an annual basis what percentage (based on value of goods and services) of all products manufactured at this plant are shipped directly to Federal defense agencies (such as the Departments of the Army, Navy, Air Force, Marine Corps, the Defense Logistics Agency, etc.)?	<b>916</b> 1 <input type="checkbox"/> 1 to 25% 2 <input type="checkbox"/> 26 to 75% 3 <input type="checkbox"/> Over 75% 4 <input type="checkbox"/> None 5 <input type="checkbox"/> Don't know      } Skip to item 8
7. Of the shipments to Federal defense agencies reported above in item 6, what percentages are shipped to the agencies listed?	<b>917</b> 1 <input type="checkbox"/> Department of the Army      _____ % 2 <input type="checkbox"/> Department of the Navy      _____ % 3 <input type="checkbox"/> Department of the Air Force      _____ % 4 <input type="checkbox"/> Marine Corps      _____ % 5 <input type="checkbox"/> Defense Logistics Agency      _____ % 6 <input type="checkbox"/> Other      _____ % - Specify _____  <b>TOTAL</b> <u>100%</u>
8. On an annual basis what percentage (based on value of goods and services) of all products manufactured at this plant are shipped to other companies that are prime contractors to Federal defense agencies?	<b>918</b> 1 <input type="checkbox"/> 1 to 25% 2 <input type="checkbox"/> 26 to 75% 3 <input type="checkbox"/> Over 75% 4 <input type="checkbox"/> None 5 <input type="checkbox"/> Don't know

SECTION B – CHARACTERISTICS OF THE ESTABLISHMENT – Continued	
9. What percent of this plant's total value of shipments are exported for direct sale? Include shipments to foreign subsidiaries.	<b>919</b> 1 <input type="checkbox"/> None 2 <input type="checkbox"/> Less than 10% 3 <input type="checkbox"/> 10 to 19% 4 <input type="checkbox"/> 20 to 49% 5 <input type="checkbox"/> 50% or more
10. Where is most of the research and development work for this plant done?	<b>920</b> 1 <input type="checkbox"/> Outside the firm 2 <input type="checkbox"/> In this plant 3 <input type="checkbox"/> Elsewhere in the firm 4 <input type="checkbox"/> No research and development done
11. Where is most of the formal training for staff of this plant conducted?	<b>921</b> 1 <input type="checkbox"/> In this plant 2 <input type="checkbox"/> Elsewhere in the firm 3 <input type="checkbox"/> Outside the firm 4 <input type="checkbox"/> No formal training for staff – Skip to item 13
12. Who conducts most of the formal training for staff of this plant?	<b>922</b> 1 <input type="checkbox"/> Staff from this plant 2 <input type="checkbox"/> Staff from elsewhere in the firm 3 <input type="checkbox"/> Trainers from outside the firm
13. How difficult has it been to hire skilled personnel to work with the technologies used in this plant?	<b>923</b> 1 <input type="checkbox"/> Not difficult 2 <input type="checkbox"/> Some problems 3 <input type="checkbox"/> Very difficult
14. Does a foreign entity (company, individual, government, etc.) own, directly or indirectly, 10 percent or more of the voting stock or other equity rights in this plant?	<b>924</b> 1 <input type="checkbox"/> Yes 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know
REMARKS	

**SECTION C - VERIFICATION**

**Please make certain that all items are complete so that we will not have to contact you again. Thank you for your cooperation.**

REMARKS

**SECTION D - CONTACT****1. Name of person to contact regarding this report - *Please print or type*****2. Title****3. Telephone****4. Signature of authorized official****5. Date**

Area code

Number

Extension

Month

Day

Year



## Appendix C. Sampling and Estimating Methodologies

### SAMPLING METHODOLOGY

The estimates within this report are based upon a sample of establishments selected randomly. The methodology used to select the sample is as follows.

The scope of the survey was defined to include all manufacturing establishments classified within U.S. Standard Industrial Classification (SIC) Code Major Groups 34 to 38. The universe frame for the SMT was constructed from the Census Mail File. A total of 43,551 establishments were identified as in-scope. For sampling purposes and publication considerations, the universe frame was stratified by three-digit SIC and total employment size classification (SIC-3 x TE). Three TE size breaks were used in the stratification process: 20 to 99, 100 to 499, and 500 or more.

Since the primary intent of the report was to produce estimated establishment counts and prevalence rates at stratified and aggregate levels, simple random sampling (SRS) was chosen as the most efficient sampling procedure. In stratified SRS, each stratum is treated as a population from which an independent sample is selected. Each sampling unit (i.e., establishment) within the stratum has an equal chance of being selected. Of the 43,551 in-scope establishments, 8,432 were selected for the survey.

### Estimated Establishment Counts

Estimated establishment counts for the various publication level cell categories are derived as simple weighted estimates where the stratum weights, the inverse of the sampling fraction for any given stratum, serve as establishment weights. The method of estimation is described below.

**Estimates.** The following assumes  $L$  strata comprise publication cell  $j$ . Each stratum  $h$  ( $h = 1, 2, \dots, L$ ) has a population of  $N_h$  from which a sample of size  $n_h$  has been selected. Each estimated establishment count,  $X'_j$ , for publication cell  $j$  is computed as follows:

$$X'_j = \sum_{h \in j} \sum_{i=1}^{n_h} W_h X_{ih} = \sum_{h \in j} X'_h \quad (1)$$

where

$X'_j$  is the estimated total establishment count for the criteria of interest defined by cell  $j$ .

$X'_h$  is the estimated total establishment count for the criteria of interest defined by stratum  $h$ .

$W_h = N_h/n_h$  is the sampling weight associated with the  $n_h$  establishments of stratum  $h$  (i.e., the inverse of the sampling fraction  $f_h = N_h/n_h$ ).

$X_{ih} = 1$  if establishment  $i$  of stratum  $h$  satisfies the criteria of interest defined by cell  $j$ .

$= 0$  if it does not.

**Relative Standard Errors of Estimated Counts.** To estimate the variance of an estimated total  $X'_j$  for cell  $j$ , it was necessary to estimate the variance contribution of each of the individual stratum cells (SIC-3 x TE) which combined to form cell  $j$ . For a given stratum  $h$ , the variance is estimated by

$$\sigma^2_{x'_h} = (1 - p_{x'_h}) (W_h) (W_h - 1) (n_{x'_h}) \quad (2)$$

where  $W_h$  is defined above, and  $n_{x'_h}$  is the total number of sample establishments in stratum  $h$  satisfying the criteria of interest for cell  $j$ , and  $p_{x'_h}$  is the proportion of establishments satisfying the criteria of interest, as defined below.

$$p_{x'_h} = \frac{n_{x'_h}}{n_h} = \frac{\sum_{i=1}^{n_h} X_{ih}}{n_h} \quad (3)$$

The sum of the stratum variances is the variance of the estimated establishment count  $X'_j$  for cell  $j$  as represented below.

$$\sigma^2_{x'_j} = \sum_{h \in j} \sigma^2_{x'_h} \quad (4)$$

Finally, the relative standard error,  $V_{x'_j}$ , of the estimated total  $X'_j$ , the value appearing in the tables, is defined below:

$$V_{x'_j} = \frac{\sigma_{x'_j}}{(X'_j)} \quad (5)$$

## Estimated Prevalence Rates

**Estimates.** Prevalence rates for cell  $j$  are expressed as the ratio of two estimated establishment counts:

$$pr'_j = \frac{X'_j}{Y'_j} \quad (6)$$

where  $X'_j$  and  $Y'_j$  are simple weighted counts as defined in the "Estimated Establishment Counts" subsection.

### Absolute Standard Error Estimates of Prevalence Rates.

The variance,  $\sigma^2_{pr'_j}$ , of prevalence rate  $pr'_j$ , above, is defined by:

$$\sigma^2_{pr'_j} = [pr'_j]^2 \left[ \frac{\sigma^2_{X'_j}}{X'^2_j} + \frac{\sigma^2_{Y'_j}}{Y'^2_j} - 2 \left( \frac{\sigma_{X'_j Y'_j}}{X'_j Y'_j} \right) \right] \quad (7)$$

where

$X'_j$ ,  $\sigma^2_{X'_j}$  and  $pr'_j$  are defined above.  $Y'_j$  and  $pr'_j$  are computed in a similar fashion. The covariance term  $\sigma_{X'_j Y'_j}$  is computed as:

$$\sigma_{X'_j Y'_j} = \sum_{h \in j} \sigma_{X'_h Y'_h} = \sum_{h \in j} \left[ \left( 1 - \frac{p_{X'_h Y'_h}}{p_{X'_h} p_{Y'_h}} \right) (W_h) (W_h - 1) (n_{X'_h Y'_h}) \right] \quad (8)$$

where:

$n_{X'_h}$ ,  $p_{X'_h}$  are defined by the numerator and are described above, and

$n_{Y'_h}$ ,  $p_{Y'_h}$  are defined similarly for the denominator.

$n_{Y'_h X'_h}$  is the total number of establishments in stratum  $h$  satisfying the criteria of interest as defined by both the numerator and denominator.

$p_{X'_h Y'_h}$  is equal to  $n_{X'_h Y'_h} / n_h$

Finally, the absolute standard error of the prevalence rate  $pr'_j$ , the value found in the tables, is obtained by taking the square root of the variance,  $\sigma^2_{pr'_j}$

$$\sigma_{pr'_j} = \sqrt{\sigma^2_{pr'_j}} \quad (9)$$

**Ratio Estimates.** Tables 10 through 14 of this report display additional ratio estimates and their associated standard errors. These ratios are not ratios of estimated establishment counts, but are estimated averages of establishment values for the various survey variables.

**Estimates.** We estimated the cell ratio,  $r'_j$ , as the weighted average of the individual establishment totals contained within cell  $j$ .

$$r'_j = \frac{\sum_{h \in j} \sum_{i=1}^{n_h} W_h Q_{ih}}{\sum_{h \in j} \sum_{i=1}^{n_h} W_h Z_{ih}} = \frac{Q'_j}{Z'_j} \quad (10)$$

where:

$W_h$  is defined in above.

$Q_{ih}$  = the value associated with the  $i$ th establishment in stratum  $h$  if the criterium of interest, as defined by cell  $j$ , is satisfied.

= 0 if it is not satisfied.

$Z_{ih}$  = 1 if establishment  $i$  of stratum  $h$  satisfies the criterium of interest, as defined by cell  $j$ .

= 0 if it does not.

**Absolute Standard Errors of Ratio Estimates.** To estimate the variance of an estimated ratio,  $r'_j$ , for cell  $j$ , it was necessary to estimate the absolute variances  $\sigma^2_{Q'_j}$  and  $\sigma^2_{Z'_j}$ , and covariance  $\sigma_{Q'_j Z'_j}$

$$\sigma^2_{Q'_j} = \sum_{h \in j} (N_h) (W_h - 1) \left[ \left( \frac{\sum_{i=1}^{n_h} Q_{ih}^2}{n_h - 1} \right) - \left( \frac{(\sum_{i=1}^{n_h} Q_{ih})^2}{(n_h) (n_h - 1)} \right) \right] \quad (11)$$

$$\sigma^2_{Z'_j} = \sum_{h \in j} (N_h) (W_h - 1) \left[ \left( \frac{\sum_{i=1}^{n_h} Z_{ih}^2}{n_h - 1} \right) - \left( \frac{(\sum_{i=1}^{n_h} Z_{ih})^2}{(n_h) (n_h - 1)} \right) \right] \quad (12)$$

$$\sigma_{Q'_j Z'_j} = \sum_{h \in j} (N_h) (W_h - 1) \left[ \left( \frac{\sum_{i=1}^{n_h} Q_{ih} Z_{ih}}{n_h - 1} \right) - \left( \frac{(\sum_{i=1}^{n_h} Q_{ih}) (\sum_{i=1}^{n_h} Z_{ih})}{(n_h) (n_h - 1)} \right) \right] \quad (13)$$

where  $\sum_{h \in j} Z_{ih} = n_{Z'_h}$  for a given stratum  $h$  since  $Z_{ih} = 1$  for a particular establishment if the criterium of interest has been satisfied.

Finally, the absolute standard error,  $\sigma_{r'_j}$ , of the estimated ratio  $r'_j$ , is computed by taking the square root of the variance estimate,  $\sigma^2_{r'_j}$ , described below.

$$\sigma^2_{r'_j} = [r'_j]^2 \left[ \frac{\sigma^2_{Q'_j}}{Q'^2_j} + \frac{\sigma^2_{Z'_j}}{Z'^2_j} - 2 \left( \frac{\sigma_{Q'_j Z'_j}}{Q'_j Z'_j} \right) \right] \quad (14)$$

## Limitations of the Data

**Sampling Error.** The sample drawn for this survey is but one of many possible samples that could have resulted using the sampling methodology described earlier. Each of these possible samples would likely yield somewhat different estimated establishment counts, prevalence rates, and



ratio estimates. The sampling error for a given sample is defined as the difference between the sample estimate and the result theoretically obtainable from a comparable complete canvass of the target population. For this particular sample, this error is unknown.

In conjunction with its associated estimate, the standard error can be used to construct confidence intervals about the sample estimate. These intervals allow one to ascribe a probability or confidence that the complete coverage value falls within those intervals. More precisely:

- a. The interval defined by one standard error above and below the sample estimate can be expected to include the complete coverage value with 67 percent confidence.
- b. The interval defined by two standard errors above and below the sample estimate can be expected to include the complete coverage value with 95 percent confidence.
- c. The interval defined by three standard errors above and below the sample estimate can be expected to include the complete coverage value.

For establishment counts, relative standard errors appear in the tables. To convert a relative standard error to a standard error, use the formula

$$\sigma_{X_i} = (V_{X_i})(X'_i). \quad (15)$$

Then  $X'_i \pm (m)(\sigma_{X_i})$  for  $m = 1, 2$ , and  $3$  defines the intervals described above.

**Nonresponse.** Not all selected establishments chose to respond to the survey and not all respondents completed each questionnaire item. No attempt was made to impute for either type of nonresponse. We have chosen to provide, as a separate estimate in each of the table presentation a "Not specified" estimate. Thus, every mailed establishment of the survey is accounted for in each of the tables. The "not specified" estimates may contain establishments other than nonrespondents. For example, if a respondent indicated to us that the plant surveyed was out of business, the responder was tallied as "not specified". In any event, estimated counts cannot be interpreted as universe estimates unless the "not specified" cell happens to be zero. They can be characterized as representing estimated lower bounds.

Because of the "not specified" classification, the estimated prevalence rates and ratio estimates presented in the tables should also be viewed with caution because they are based strictly upon reporters for the appropriate categories. For example, the prevalence rate in table 5A for USED IN OPERATIONS-AGE OF PLANT UNDER 5 YEARS is based only upon (1) those respondents who reported that the age of their plant are less than 5 years of age, and (2) the subset of those same respondents who reported that they use the technology defined by table 5A. We were not able to obtain a response for every plant to the "age of plant" inquiry. As a result, the "Not Specified" Column was created in the "age of plant" category. As mentioned above, no attempt was made to ascribe responses to specific plants who either failed to return their questionnaire or who returned the questionnaire, but failed to answer particular inquiries. If the response pattern of such nonrespondents were known, it is likely that the prevalence rates would be somewhat different.





## Appendix D. Estimates of Relative Standard Errors

### ESTIMATES OF RELATIVE STANDARD ERRORS FOR THE NUMBER OF ESTABLISHMENTS, BY CHARACTERISTIC

Establishment characteristic	Number of establishments	Relative standard error (percent) <sup>1</sup>
Age of plant (years):		
Less than 5.....	4,893	4.2
5 to 15.....	13,722	2.3
16 to 30.....	11,303	2.6
Over 30.....	9,310	2.8
Not specified.....	3,763	4.9
Manufacturing process:		
Fabrication/machining.....	6,795	3.8
Assembly.....	6,388	2.6
Both.....	23,393	1.3
Neither.....	2,577	5.9
Not specified.....	3,838	4.8
Market for most products:		
Consumer.....	4,358	4.1
Commercial.....	5,791	3.6
Industrial.....	18,796	1.7
Transportation.....	3,974	4.0
Government.....	2,141	6.0
Other.....	3,679	4.6
Not specified.....	4,252	4.6
Market price for most products:		
Less than \$5.....	5,274	3.7
\$5 to \$100.....	10,422	2.7
\$101 to \$1,000.....	8,846	3.1
\$1,001 to \$2,000.....	2,023	6.9
\$2,001 to \$10,000.....	4,265	4.5
Over \$10,000.....	7,340	2.9
Not specified.....	4,821	4.5
Products made to military specifications:		
Yes.....	14,112	2.1
No.....	22,214	1.4
Don't know.....	2,939	5.9
Not specified.....	3,726	4.9
Percent, on an annual basis, of all products manufactured at the plant that are shipped directly to other companies that are prime defense contractors to Federal Defense Agencies:		
1 to 25 percent.....	9,934	2.8
26 to 75 percent.....	2,499	6.4
Over 75 percent.....	1,148	9.7
None.....	11,808	2.4
Don't know.....	13,573	2.2
Not specified.....	4,029	4.7
Percent of the plant's total of shipments that are exported for direct sale:		
None.....	13,687	2.3
Less than 10 percent.....	15,360	2.0
10 to 19 percent.....	4,737	3.6
20 to 49 percent.....	3,912	3.8
50 percent or more.....	1,398	6.5
Not specified.....	3,897	4.8

See footnote at the end of the table.

**ESTIMATES OF RELATIVE STANDARD ERRORS FOR THE NUMBER OF ESTABLISHMENTS,  
BY CHARACTERISTIC—Continued**

Establishment characteristic	Number of establishments	Relative standard error (percent) <sup>1</sup>
Where is most of the research and development work for the plant done:		
Outside the firm .....	1,834	7.6
In the plant .....	25,416	1.3
Elsewhere in the firm .....	4,969	3.5
No research and development done .....	7,046	3.9
Not specified .....	3,726	5.0
Where is most of the formal training for the plant conducted:		
In the plant .....	29,449	1.0
Elsewhere in the firm .....	1,099	8.1
Outside the firm .....	3,506	5.1
No formal training for staff .....	5,251	4.4
Not specified .....	3,686	4.9
Who conducts most of the formal training for the staff:		
Staff from inside the plant .....	26,952	1.2
Staff from outside the plant .....	1,637	6.3
Trainers from outside the firm .....	5,287	3.8
Not specified .....	9,115	3.1
Difficulty in hiring skilled personnel to work with the technologies used in the plant:		
Not difficult .....	13,905	2.2
Some problems .....	19,836	1.6
Very difficult .....	5,401	4.2
Not specified .....	3,849	4.9
Does a foreign entity own, directly or indirectly, 10 percent or more of the voting stock or other equity rights to the plant:		
Yes .....	3,265	3.8
No .....	34,703	0.6
Don't know .....	1,447	6.3
Not specified .....	3,576	5.0

<sup>1</sup>A description of the standard error of the estimate is given in appendix C, "Sampling and Estimating Methodology."





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